the OIL AND GAS JOURNAL

JULY 11, 1955

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Growing Canadian Imports...

. . . Will they force a change in government and industry policies?
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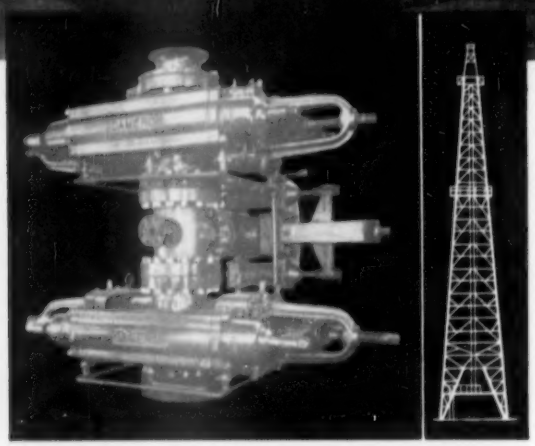

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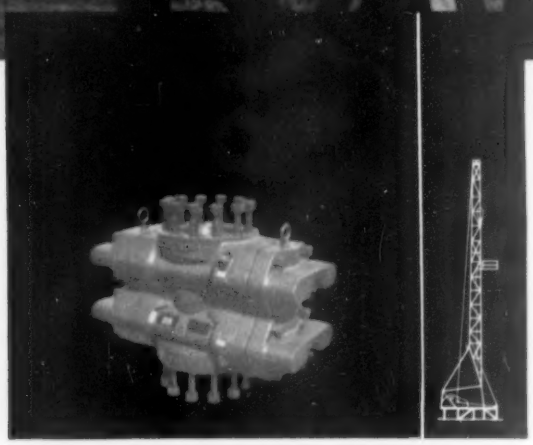

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PAGE 1 ONE . . . *a glance ahead*

Speculative talk of fast adoption of turbines for passenger automobiles worries some refiners who foresee obsolescence of equipment for making high-octane gasoline. But most forecasts are that piston engines will still be dominant for a decade and changeover in type of fuel demand will be so gradual as to cause no upheaval in refining.

Depletion allowance of oil producers may face its severest test in years next winter. Congressional committee is mapping detailed, objective study of taxation of mineral industries which will muster major artillery both for and against present practices.

Imports controversy will revolve around crude oil only, with little attention to products, due to strong demand for industrial fuel oil on Atlantic Seaboard and declining refinery yield of resid. Even coal people are losing interest because of improved market for bituminous.

Low-gravity crudes in some areas, notably Wyoming black oil, are enjoying much better market that a year ago, and at present postings are often in relatively better demand than high-gravity crudes. This is attributed to good interior demand for heavy fuel oil due to high industrial activity, increased use of asphalt and road oil, and wider use of coking.

Price of natural gas cannot increase much at delivery ends of long transmission lines whether or not FPC controls field prices. In many Middle Atlantic and Great Lakes areas a relatively small increase in gas prices will turn industrial users to coal or oil, crimp expansion in residential heating. Producers must look to less competitive markets to support higher field prices.

Future for natural-gas liquids may lie in bulk movement of unfractionated stream from groups of field plants by pipeline to refining and petrochemical centers, thus reducing transportation costs and permitting closer fractionating into specialty products. This could lead to trend toward making field plants largely absorbers and concentrating final processing in big plants.

the OIL AND GAS JOURNAL

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TECHNOLOGY—OPERATION

Barge Drilling in Caddo Lake 106

By C. W. Cachere

This specially designed barge is 80 ft. long, 40 ft. wide, 7 ft. deep. During drilling operations it is clamped to steel spud piling passed through the barge and driven into the lake bottom. This barge has proved very satisfactory for lake drilling conditions.

New Anchors for Pipeline 109

By H. C. Vander Heyden and E. A. Wallace

Main-line anchors have been installed on two 30-in. gas-transmission lines in the desert west of Blythe, Calif. Before the anchors were put in, line movement caused a 12-in. connection to fail. Increased operating pressures and temperatures caused by the addition of two booster stations were responsible for the movement.

How Oil-Pipeline Companies Fared in the First Quarter 115

Here is a summary of transportation revenues and amounts of oil pumped, taken from quarterly reports of pipeline companies to the Interstate Commerce Commission.

Why Subthrust Production Is Promising 116

By Norman S. Morrisey and Jack L. Walper

Drilling through thrust or reverse faults is uncovering sizable reserves in southern Oklahoma. Similar traps occur in California, the Rocky Mountains, and Canada. Production occurs on the downthrown side of known fault trends; the oil is trapped against a reverse or thrust fault.

How to Get Manpower for Turnarounds 119

By John W. Towler

Backed by 6 years of successful experience, Union Oil Co. uses general maintenance contractor crews to provide a fluctuating supply of craftsmen for its Los Angeles and Oleum refineries. Procedure involves the use of a combination of fixed company forces, semipermanent contractor crews, and variable contractor crews. Widely fluctuating manpower requirements for turnarounds can thus be adequately satisfied.

Field Operations in Louisiana's Venice Field 122

Severe marsh conditions, high ratio of successful completions, and unusual operational problems characterize Venice field. Field contains 37 producing sands and 122 separate oil reservoirs. Of 137 holes drilled, only 11 have been dry.

22-Day Payout for Wilcox Fracturing 124

By R. W. George, A. J. Pearson, and R. D. Patterson

Atlantic Refining Co. has fractured 21 Wilcox wells. Twenty of the fractured jobs have been successful and have paid out in an average of 22 days. In gas wells, fracturing has increased deliverability.

On-The-Job . . . In the Plants: Humidity Control for Fuel Testing 130

By F. M. Thomas

The constant control of humidity is necessary for developing and testing certain fuels. This chemical-type dehumidification system used in its Bartlesville laboratory has been found by Phillips Petroleum Co. to maintain the desired conditions effectively and economically.

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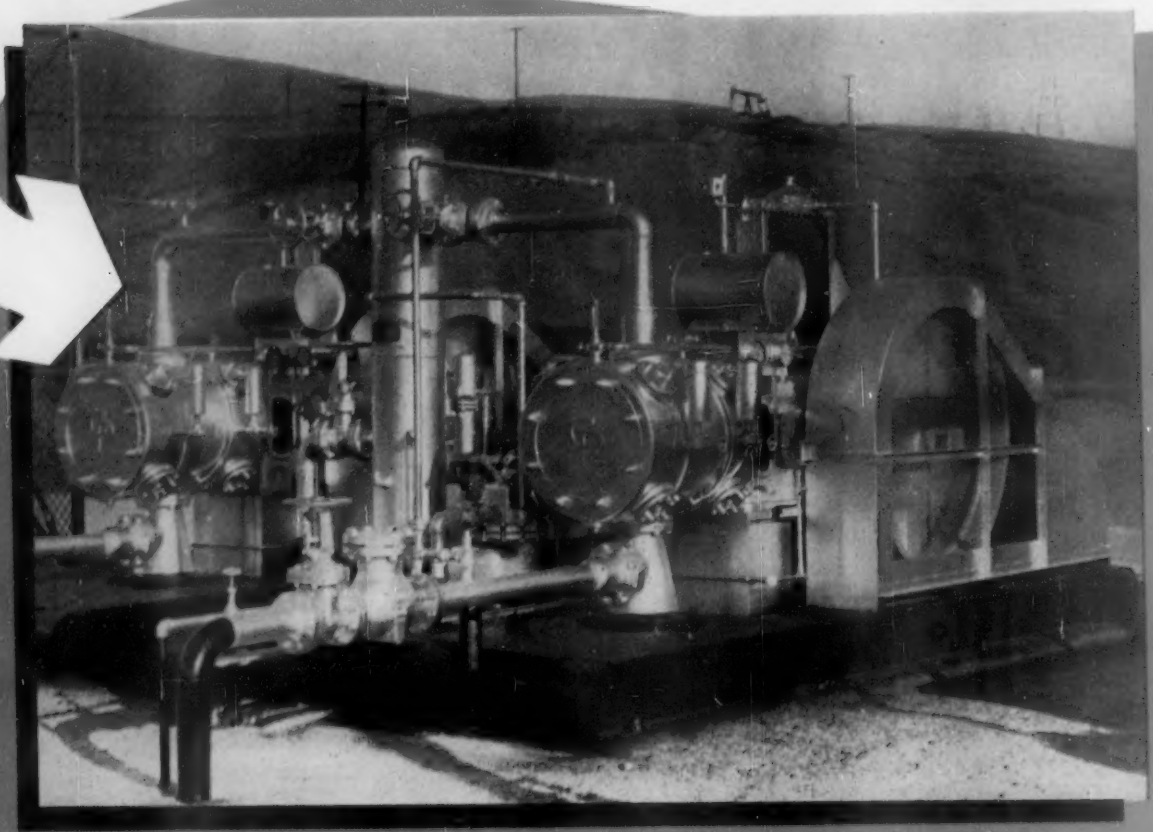
These "Oilwell" Compressor Units are SAVING Storage Tank Vapors



WHAT HAPPENS to the vapors which rise from the oil that is stored temporarily in field tank farms?

The engineers of Shell Oil Company knew that the value of the vapors lost from light oil storage tanks would repay the cost of a vacuum system.

So they worked out a hook-up on one of their field tank farms near Brea, California, where a gas trap is installed, in which the two 75 hp "Oilwell" Compressor Units (shown above) would draw off the tank vapors. Both units are skid mounted side by side and take suction on a common line through the scrubber.

From 10" to 15" vacuum is being pulled and gases are now being recovered at the rate of 400,000 to 700,000 cubic feet per day.

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Thousands of Walseal® Bronze Valves, Fittings, Flanges, and Unions comprise the major portion of the Walworth installations.

Walseal is a registered trade mark which identifies valves and fittings manufactured by the Walworth Company. Walseal products have *factory-inserted rings* of silver brazing alloy in threadless ports. Walseal joints can be made only with Walseal valves and fittings.

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Walworth Company of Canada, Ltd., Toronto

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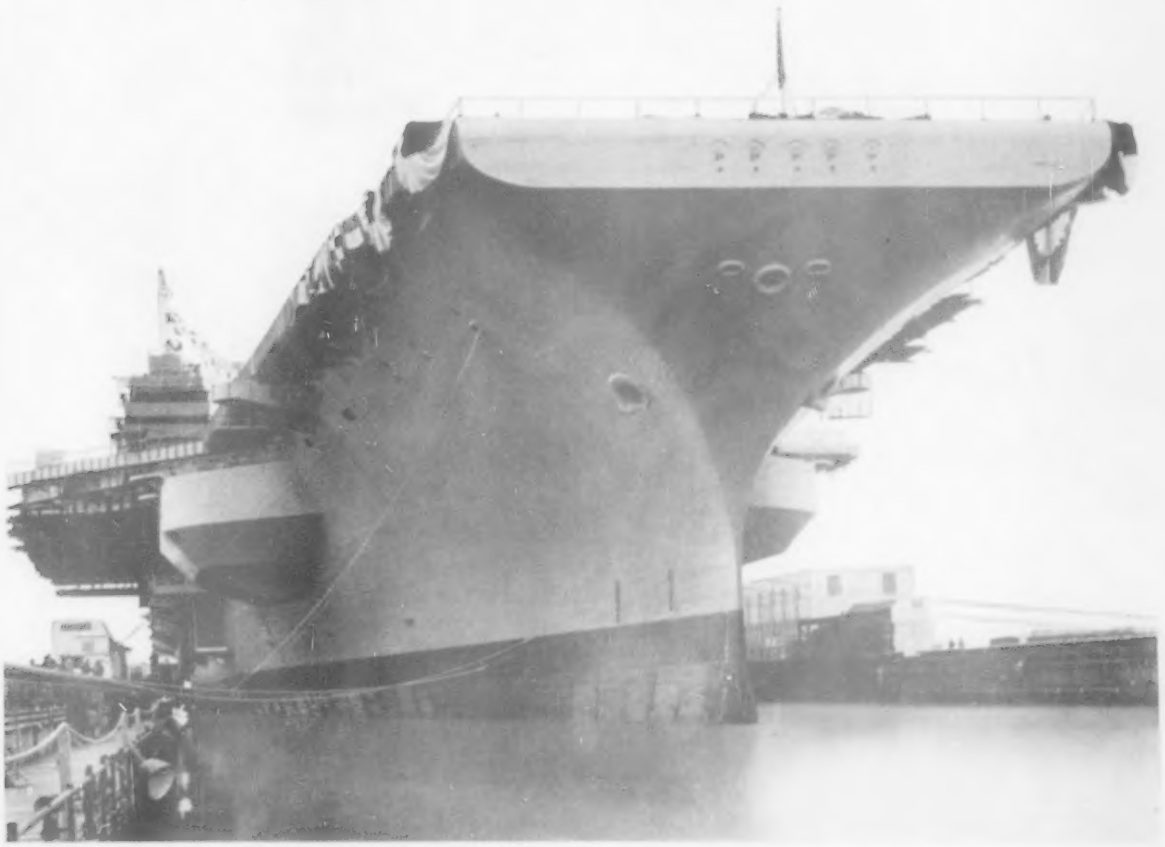
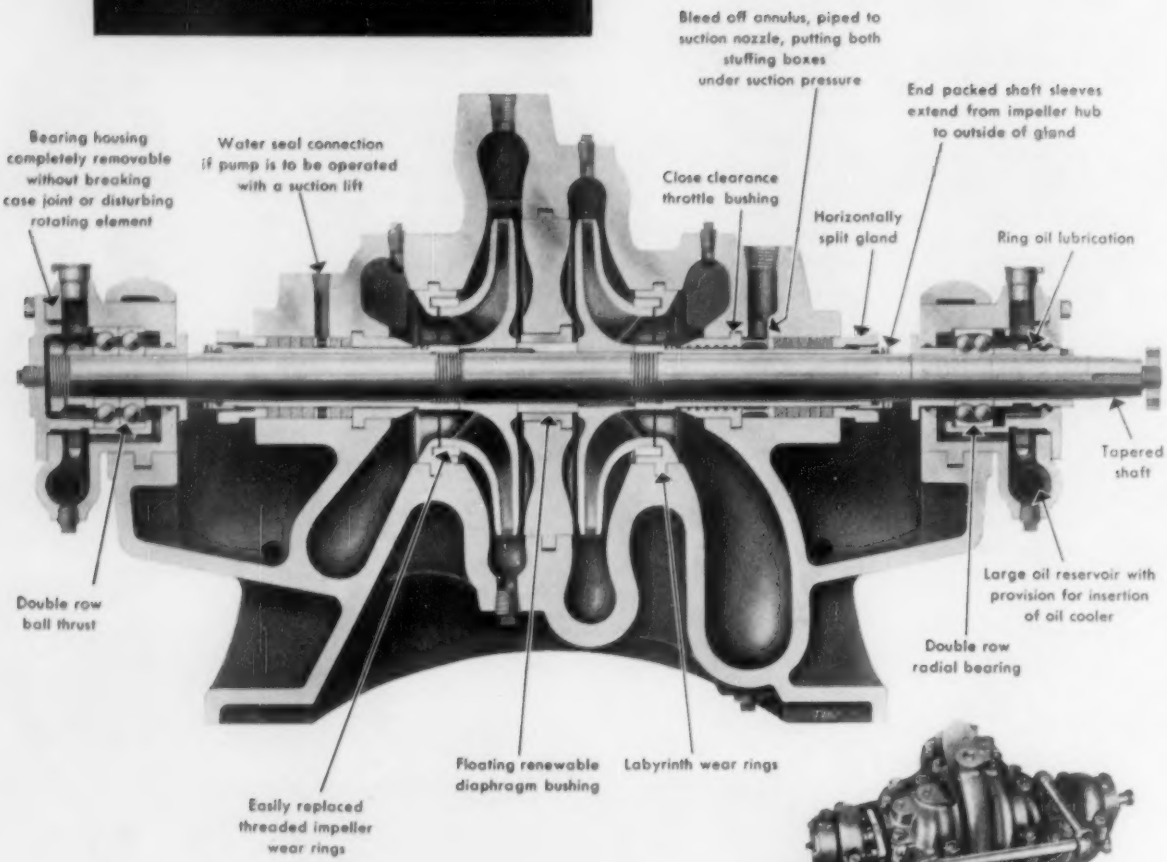
Walworth, backed by 113 years of practical valve experience, is skilled in every type of installation. Whatever the industry, if your problem concerns valves or fittings, it will pay you to call on Walworth! Distributors in principal cities throughout the world.



DE LAVAL
TWO-STAGE
HORIZONTAL PUMPS


Bleed off annulus, piped to suction nozzle, putting both stuffing boxes under suction pressure
End packed shaft sleeves extend from impeller hub to outside of gland
Bearing housing completely removable without breaking case joint or disturbing rotating element
Water seal connection if pump is to be operated with a suction lift
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Horizontally split gland
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Double row radial bearing
Floating renewable diaphragm bushing
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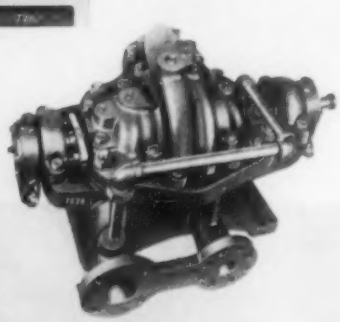
Easily replaced threaded impeller wear rings



These 14 Design Features Insure Long-range, Low-cost Service

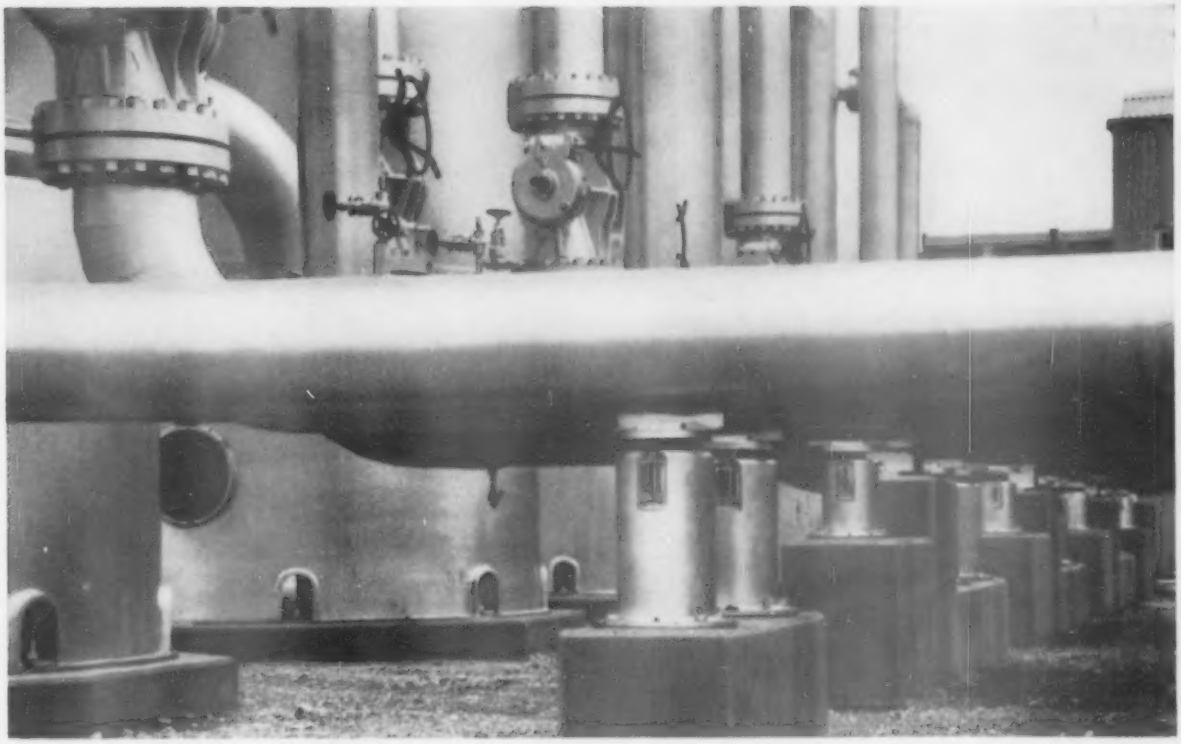
Look at the important design features highlighted in this cross-section. You will clearly see why De Laval 2IS-2KS Two-Stage Horizontal Pumps are designed to give you long, dependable, highly efficient service. • These pumps are precision-made to quality manufacturing standards. They are available in capacities from 75 to 3,000 gpm, sizes from 2" to 8" discharge and heads to 750 feet. Write for Bulletin 1501 giving complete data.

DE LAVAL *Centrifugal Pumps*

DE LAVAL STEAM TURBINE COMPANY

810 Nottingham Way, Trenton 2, New Jersey

DL-525



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Grinnell Pre-Engineered Spring Hangers

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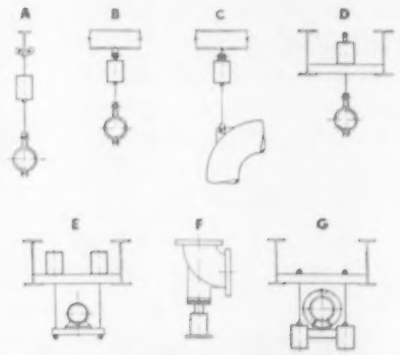

(Type A) Rod threaded to top cap (Type B) Furnished with single lug (Type C) Two lug style (Type D) Top adjusting (Type E) Adjustable top and bottom (Type F) For base support (Type G) Trapeze assembly.

The Grinnell Pre-Engineered Spring Hanger was developed after years of experience in analyzing the problems of flexible pipe suspension systems. It is *pre-engineered* to minimize changes in supporting force over total range of movement. Consider these outstanding features:

- **Maximum variation in supporting force per ½" of deflection is 10½% of rated capacity — in all sizes.**
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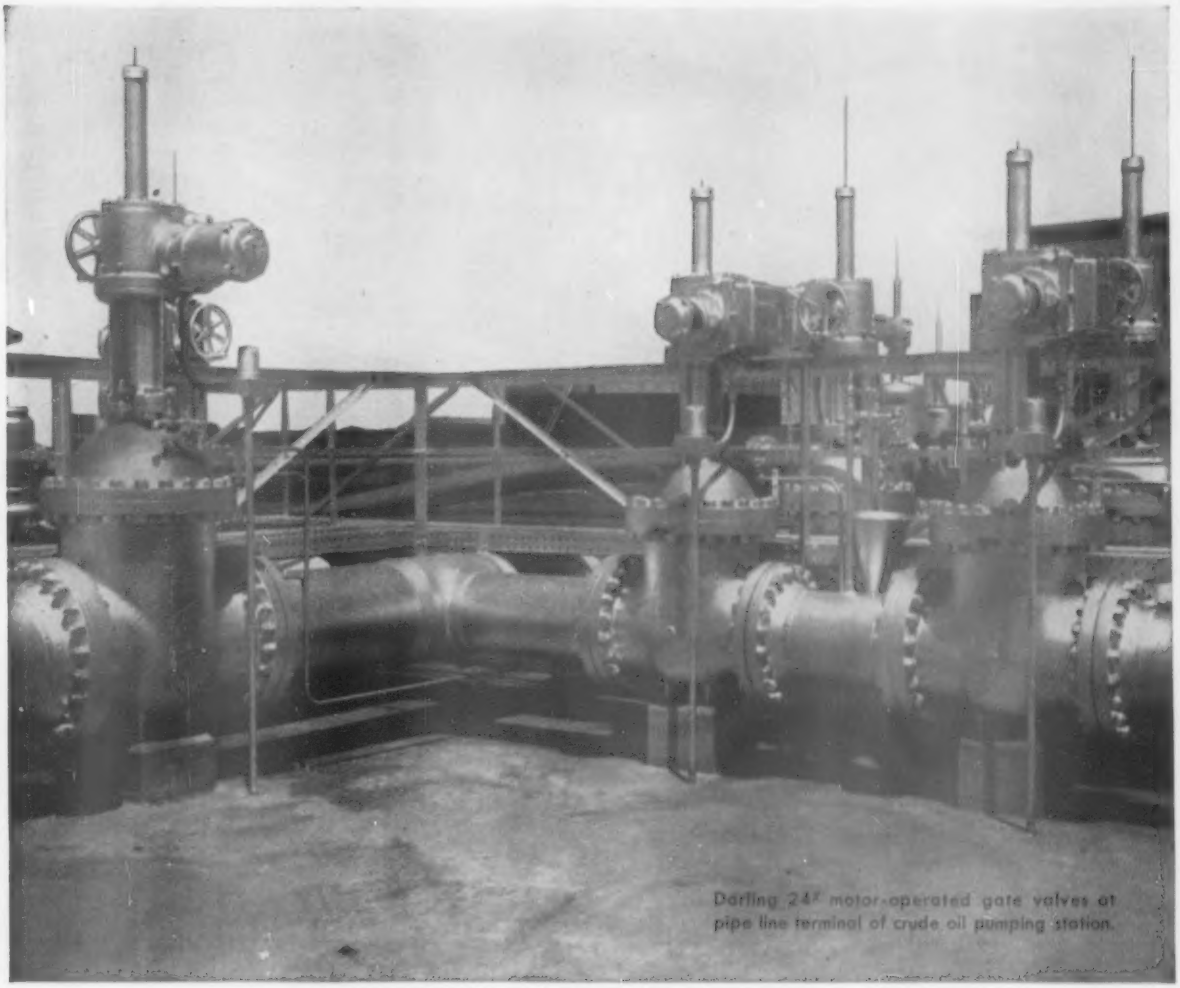

Darling 24" motor-operated gate valves at pipe line terminal of crude oil pumping station.

Why Darling gate valves work better...longer!

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Finally, with these Darling gate valves that work better, longer, you naturally minimize down time and maintenance expense. Why not get all the facts on Darling gate valves of the proper size and type for your own service needs? We'll be happy to cooperate.

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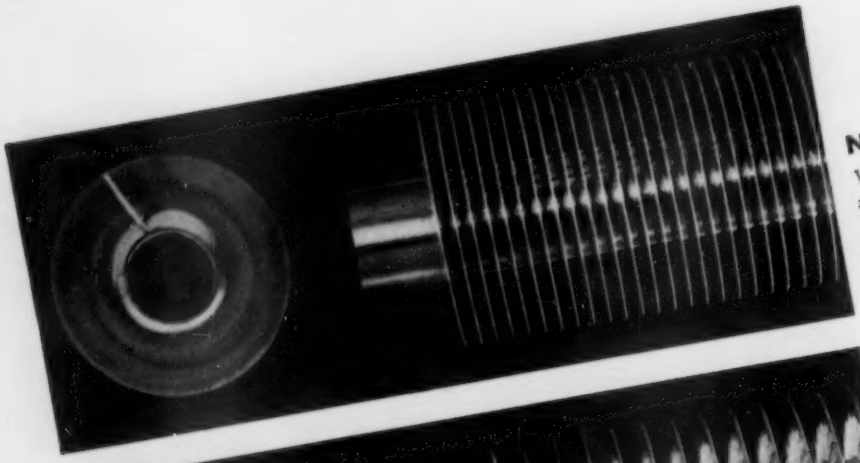
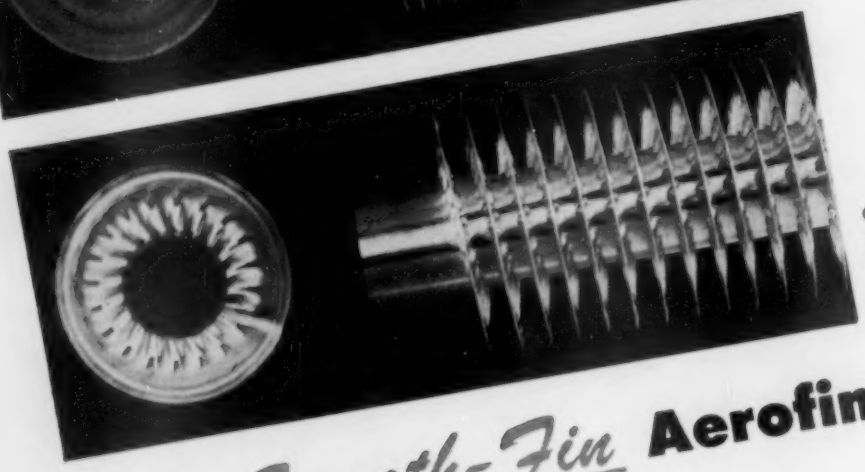


New Smooth Fins

Wide base provides ample contact surface. Smooth fins can be closely spaced without increasing resistance.



Old Type Fins

Crimped to provide necessary contact surface, widely spaced to reduce air friction.

NEW *Smooth-Fin* Aerofin Coils for Greater Capacity— Lower Resistance

Aerofin extended-surface heating and cooling coils now offer you an even greater area of effective surface — even greater capacity — per square foot of face area. Airway resistance is lowered; higher air velocities can be used. The result is extremely high heating or cooling capacity in a given space.

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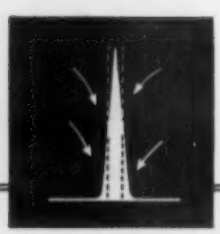
Write for Bulletin S-55



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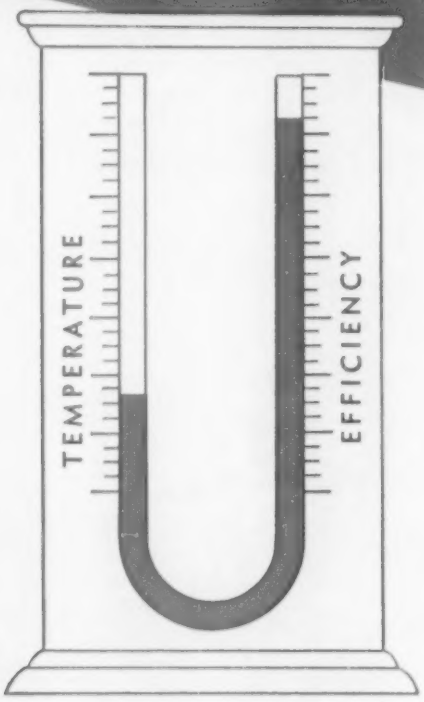

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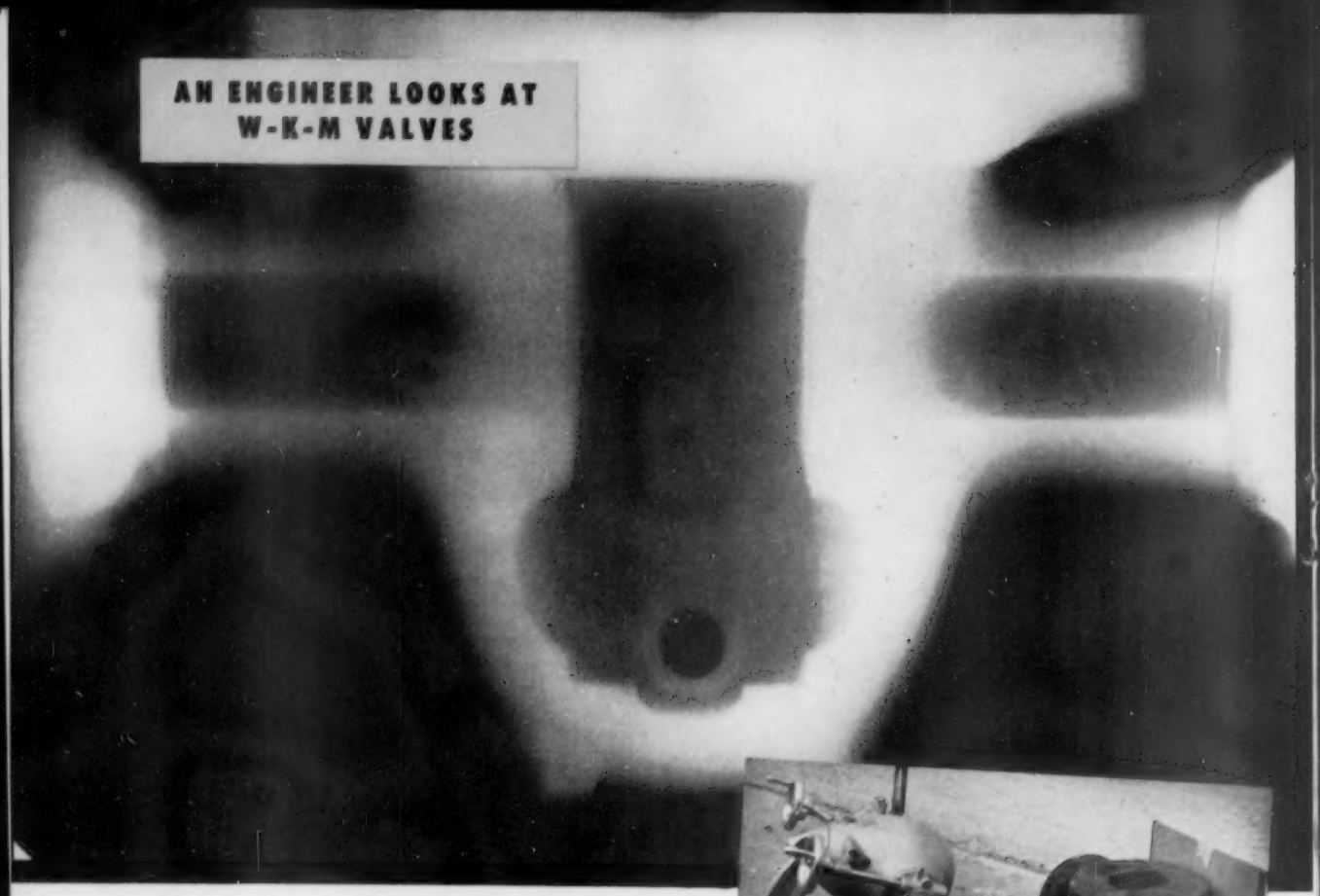
GASO PUMPS
for every oil industry need

AN ENGINEER LOOKS AT W-K-M VALVES



On Gamma Ray Inspection

Careful gamma-ray inspection by an expert will reveal the following defects in light or heavy-section steel: gas and blowholes, sand spots and inclusions, internal shrinkage, hot tears, cracks, unfused chaplets, internal chills.

While the radiographic films mean little to the uninitiated, one familiar with them can spot defects to within 2% or less of the wall thickness. For example, if the total wall thickness should measure 2", it is possible to locate a blowhole or inclusion only .04" or less in diameter.

W-K-M uses gamma-ray inspection on the W-K-M 10,000—15,000 p.s.i. test valves. They are inspected according to the procedure outlined in the ASTM Spec. E 71-47T. When you specify valves for any high pressure service, be sure to remember that W-K-M high pressure valves are the soundest, safest buy in the field.

Top: W-K-M 2", 15,000 p.s.i. Steel Valve. Notice how lettering on the body and foundry mark (right) show up. The rectangle below the top hole is a penetrameter, a steel leaf (.05" thick) taped to the body to show the penetration of the gamma rays.
Bottom: The gamma ray "camera" contains 5000 millicuries of Cobalt 60, capable of penetrating 6" steel in 3.5 hours.

W-K-M Valves

W-K-M MANUFACTURING COMPANY, INC.
A SUBSIDIARY OF acf INDUSTRIES INCORPORATED
P. O. Box 2117, Houston 1, Texas Los Angeles, California
Export Office: 45 Rockefeller Plaza, New York, N. Y.

REPUBLIC CHAMPION

ROTARY DRILLING HOSE

HAS 4 SPECIAL ADVANTAGES

1. **Internal anti-shock design gives Republic hose longer life under excessive high and pulsating pressures.**
2. **Flexible over-all construction makes hose handle easier and hang freely in the derrick.**
3. **Built-in steel muscles hold original shape — and protect hose against distortion.**
4. **Oil-resistant Reprene inside and out.**

Plus

No bolts, flanges or protrusions of any kind to catch on the rigging! The patented Boltless coupling used in all Republic Rotary Hose is a lightweight, compactly designed unit streamlined to the shape of the hose.

PATENTED BOLTLESS COUPLING

● Flush-fitting, streamlined couplings are built into all Champion Rotary Drilling Hose. They will not leak or work loose during the life of the hose, and the integral construction plus end reinforcement prevent hose breakage behind the coupling.

The coupling is firmly imbedded in the hose carcass and locked permanently in position. This leak-proof union is protected against the abrasive action of flowing mud by a specially designed hydraulic gasket which tightens the seal when the pressure increases . . . the higher the pressure, the tighter the seal.

Every length of Republic Rotary Drilling Hose is rigidly tested prior to shipment. Type C Hose is designed to withstand pressures up to 5000 psi., Type B up to 4000 psi., and Type A up to 3000 psi. Available in standard lengths up to 55'. See your Republic Distributor today or write direct for further information.

"Quality Hose Builders for Over 50 Years"

Stocked in the Mid-Continent Area by JONES & LAUGHLIN STEEL CORPORATION, Supply Division P.O. Drawer 2481, Tulsa 2, Okla. and the J & L Store in YOUR field.

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

INDUSTRIAL RUBBER PRODUCTS

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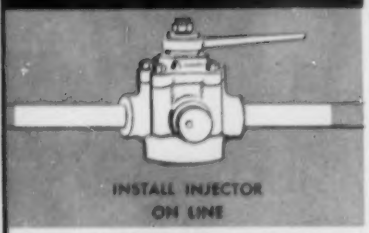
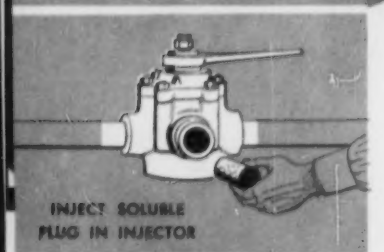
KINNEY PLUG INJECTOR



INSTALL INJECTOR ON LINE

FLOW IS BY-PASSED — NO SHUTDOWN

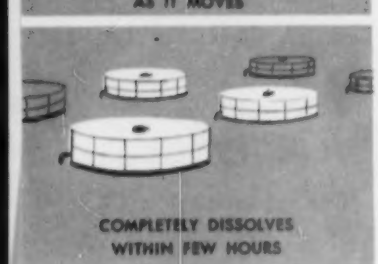


INJECT SOLUBLE PLUG IN INJECTOR

PRESSURE PUSHES PLUG

PLUG TURNS ALL BENDS IN PIPE

AND CLEANS PARAFFIN AS IT MOVES



COMPLETELY DISSOLVES WITHIN FEW HOURS

Removes Paraffin Without Shutting Down the Well . . .

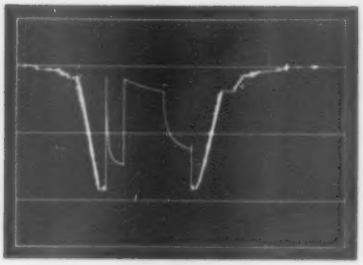
KEEPS FLOW LINES OPEN

Hundreds of wells have already been equipped with Kinney Plug Injector on the flow lines. Made in sizes from 1" to 4" for low pressure and high pressure, and larger sizes on special order, the Kinney Plug Injector receives the Soluble-Mechanical Plug by a simple turn of the handle which causes the flow to by-pass (see diagram to the left). When plug is inserted and the handle turned in regular operating position, the plug is forced through the paraffin zone. The wax dislodged from the walls of the pipe by the moving plug is then carried out with the production oil. No shut-down time necessary, as a 1" by-pass allows for equalized pressure to avoid damaging the plug. The Soluble-Mechanical Plug disintegrates within a few hours after injection, and need not be retrieved. The plug is designed to hold its hardness long enough to do the job and, at the same time, make all the necessary turns in the pipe in order to reach the destination.

ALCO

ALCO PRODUCTS, INCORPORATED

Formerly American Locomotive Company
Oil Tool Sales Office—1404 Dunlavy—Houston 19, Texas
Oil Tool Warehouses in Beaumont and Odessa



BT CHART CAN NOW REVEAL INITIAL AND FINAL CIP!..

Important New Reason Why HALLIBURTON'S Best For Your Drill Stem Test!

Because it's the most precise pressure recording device, new testing techniques are being developed to increase data obtained by Halliburton's Bourdon Tube.

Outstanding new development is recording Initial Closed In Pressure prior to opening tester for flow period, and continuing with a Final Closed In Pressure after the flow period.

This important new technique is possible by adding a Halliburton designed disc sub to the testing string in a correctly calculated position.

At the completion of the test, Halliburton provides special readings with the BT charts that involve division of build up curves into pressure vs time segments, which can then be used with mathematical equations and formulas for reservoir evaluation. These formulas may be used to extrapolate the CIP curve to static formation pressure—to determine the effective permeability of the zone tested, to establish the skin effect of the formation, etc.

More than ever, now, Halliburton's Hydro-Spring Test is the most economical way to evaluate the producing potential of a reservoir. Use it to make your job easier, better, more successful. Phone your local or district office of the Halliburton Oil Well Cementing Company.

HALLIBURTON
TESTING SERVICE

211 SERVICE CENTERS—
JUST MINUTES AWAY FROM ANY RIG

Don't Go To Sleep When Selecting Power —

by this we mean, don't make a final decision until you have considered ALL the factors — Capital Investment — Cost of Operation, namely maintenance, manpower, depreciation and FINAL COST. Many attempts have been made to generate Electric Power cheaper than by the Electric Power Company, but experience proves PURCHASED ELECTRIC POWER to be the most reliable at the lowest cost.

Petroleum Electric Power Association

P. O. BOX 2771, DALLAS, TEXAS

ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY

CALL YOUR LOCAL ELECTRIC POWER COMPANY FOR POWER FACTS

Help us take the wraps off...

THE INDUSTRY'S

NEWEST DEVELOPMENT

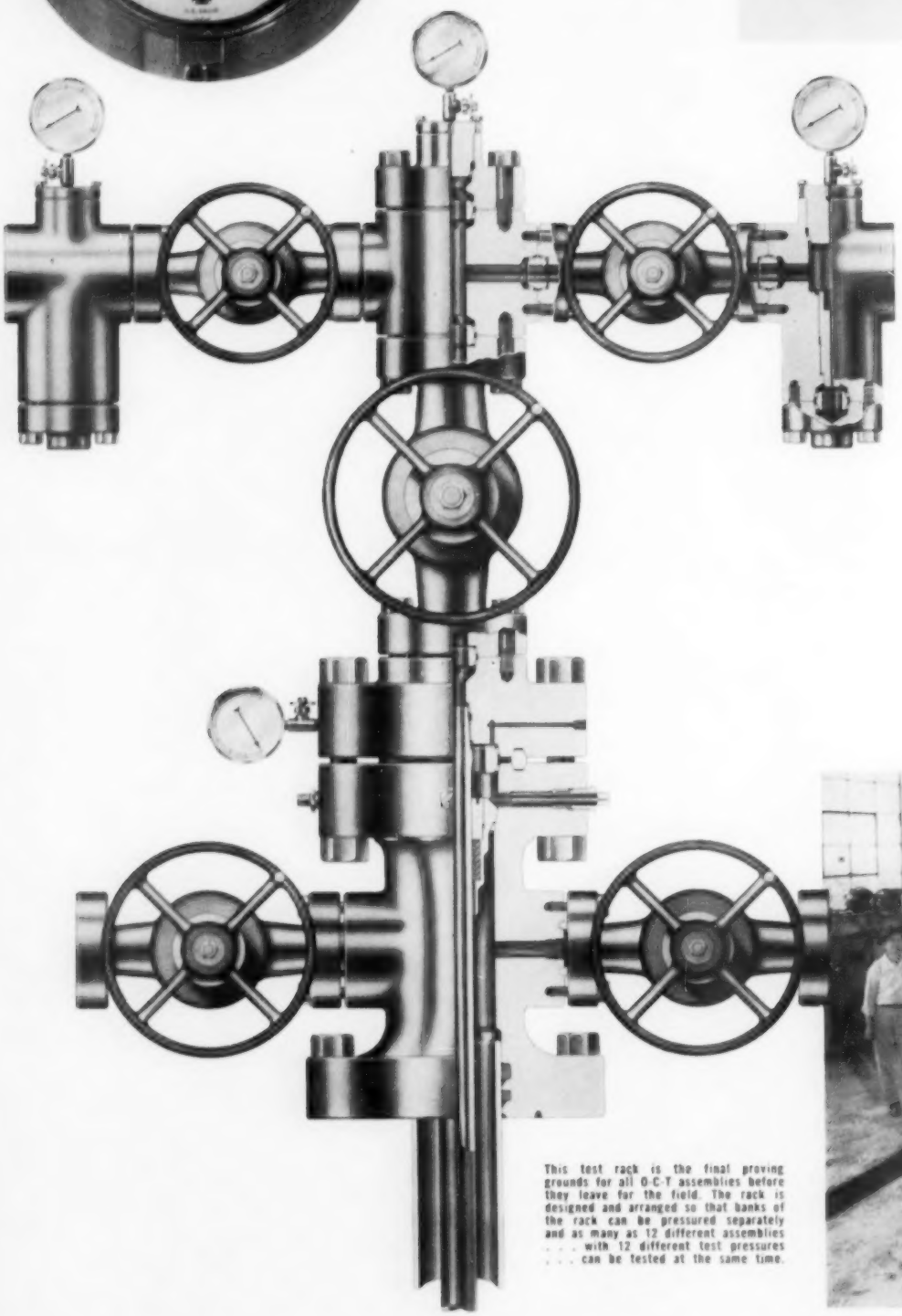
IN HIGH PRESSURE

CONTROL EQUIPMENT

Lift this flap

HERE IT IS! the indu

TWICE BE



OIL CE
INDUST

Here is anothe
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safe, high pres

O-C-T has pio
of equipment,
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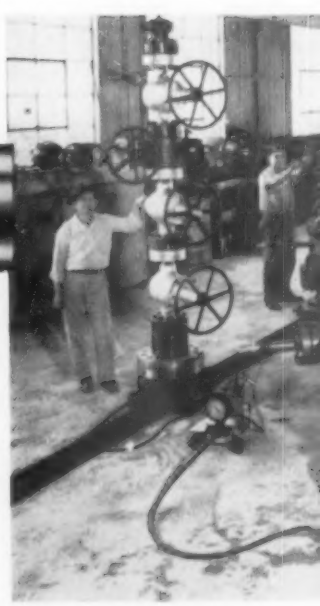
Tree
. . . the first 10
. . . the first 15



This test rack is the final proving grounds for all O-C-T assemblies before they leave for the field. The rack is designed and arranged so that banks of the rack can be pressured separately and as many as 12 different assemblies . . . with 12 different test pressures . . . can be tested at the same time.

ndustry's FIRST 30,000 LB. TEST CHRISTMAS TREE by O·C·T

BEFORE

. . . . with the first 10,000 lb. test and first 15,000 lb. test assembly

L CENTER TOOL COMPANY HAS PIONEERED THE DUSTRY'S HIGHEST PRESSURE WELLHEAD ASSEMBLIES

is another in the growing list of O-C-T contribu- to meet the challenges of the oil industry for high pressure equipment.

has pioneered many other progressive pieces uipment, including

e first factory-assembled and tested Christmas ee

e first 10,000 lb. test Christmas Tree

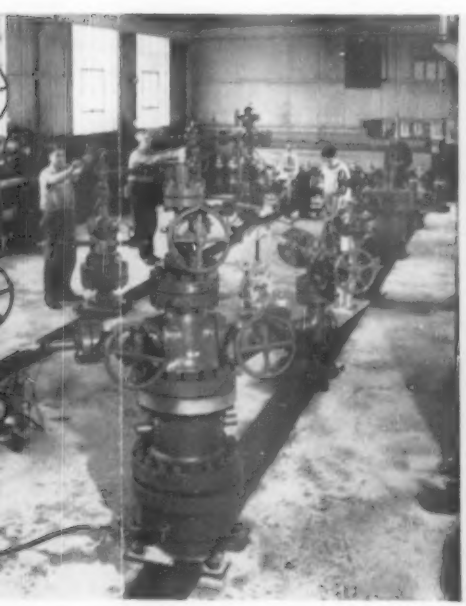
e first 15,000 lb. test Christmas Tree

. . . the first casing head with an automatic seal

. . . the first and only flow control that gives the advantages of both a choke and a valve

. . . the first dual equipment

And now, we are proud to announce that Oil Center Tool Company research and development has produced this new high pressure Christmas Tree. Weighed on the scales in relation to its contributions to oil industry equipment progress, Oil Center Tool Company has again taken the lead in serving the industry.

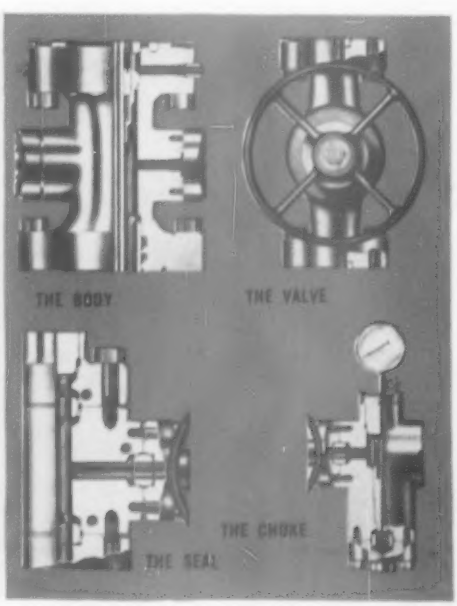


THE BODY All components of the new O-C-T 30,000 lb. Test Christmas Tree are machined from carefully selected, special analysis steel. Each component has been tested individually to pressures far in excess of the 30,000 lb. rating of the complete assembly.

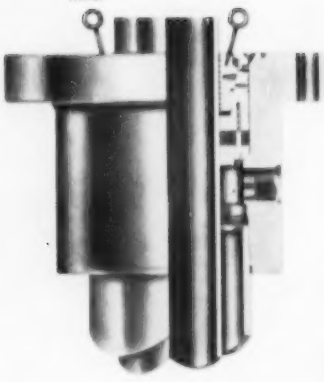
THE SEAL The Laurent Float Ring Seal is employed throughout the new O-C-T 30,000 lb. tree, in addition to conventional API Ring Seal gaskets. The Laurent Float-Ring . . . proved in hundreds of other applications . . . is now used exclusively by O-C-T and has proven superior to any other tested in this extreme pressure range.

THE VALVE W-K-M's new high pressure valves, used on the O-C-T 30,000 lb. test Christmas Tree, are designed with a balanced stem to overcome the heavy stem loads inherent to single stem valves. This valve requires much less effort to operate since the force on the handwheel must overcome only the gate drag during operation.

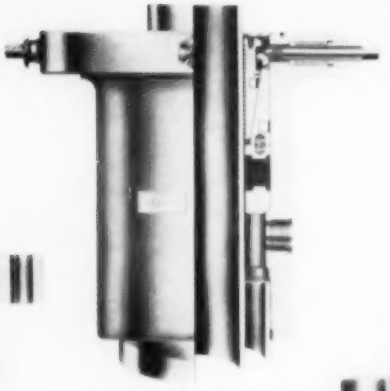
THE CHOKE The choke employed in the design of the new 30,000 lb. Test O-C-T Christmas Tree incorporates the standard and proved O-C-T choke beans. They can be furnished with various wear-resistant alloys. The special heavy design choke is provided at this time only with a positive choke. The choke body, however, is designed so that an adjustable choke is interchangeable.



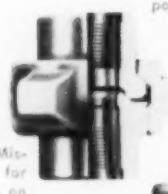
The New 30,000 lb. test assembly by O·C·T is a companion to these proved O·C·T products



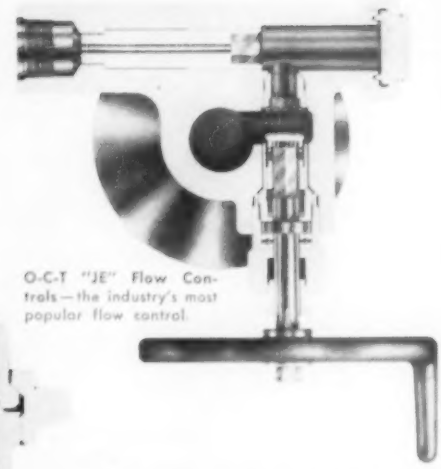
O-C-T "C-20" Casing Heads save hours of rig time.



O-C-T "C-19" Casing Heads eliminate open hole hazards.

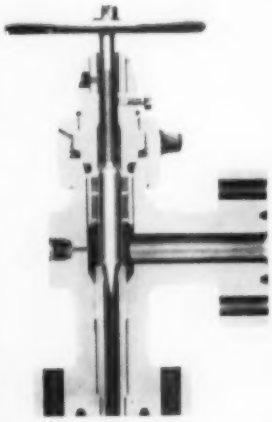


O-C-T Ball Seat Misaligning Unions for better connections on your lines.

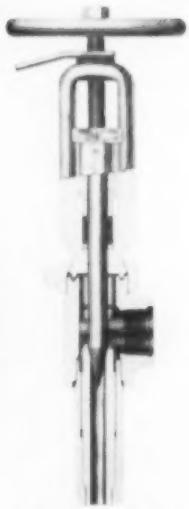


O-C-T "JE" Flow Controls—the industry's most popular flow control.

O-C-T Packers run in, set and pull without difficulty.

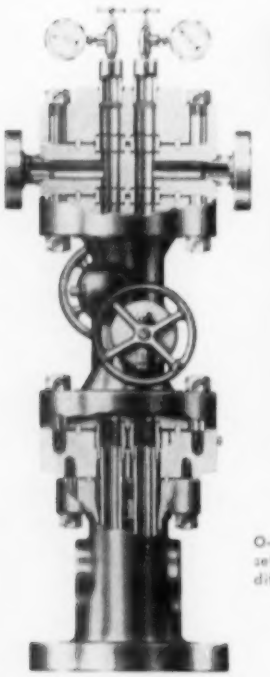


O-C-T "JW" Chokes Flexibility plus economy in a dependable choke.



O-C-T Type "N" Chokes — working pressures 1500 to 3000 lbs.

O-C-T Type "O" Chokes—interchangeability of parts gives added economy.



O-C-T Dual Controls —a safe, strong, practical assembly.

O·C·T

OIL CENTER TOOL CO.

P. O. Box 3091, Houston, Texas

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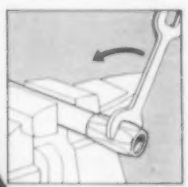
STRATOFLEX

HOSE and FITTINGS

1. Cut hose to length.



2. Screw on socket.

3. Oil inside and insert assembly tool.

4. Screw swivel nipple or male fitting into socket and remove tool.

Save Time . . . Cut Costs

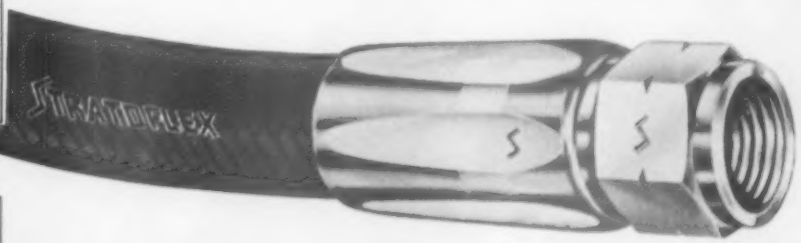
. . . in equipping new rigs or replacing worn hose assemblies. Stratoflex hose is highly resistant to abrasion and corrosion. Fittings are detachable and reusable — will not vibrate loose and are leak-proof. Your nearby Mid-Continent Supply Store stocks Stratoflex hose and fittings for hydraulic, pneumatic, fuel and oil lines.

Complete Hose Assemblies

. . . in stock in many sizes and lengths . . . or made up promptly to your specifications.

Bulk Hose and Re-usable Hose Fittings

. . . for making up your own hose assemblies in the field. Simple four-step assembly shown at left is quick and economical.



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in the manufacture of A. O. Smith Line Pipe . . .

Every fifth man on the production line is a

Quality control

SPECIALIST!

QUALITY CONTROL works full-time in the manufacture of line pipe at A. O. Smith. It's everyone's detail on his own particular job. But in addition, one out of every five employees is a *specialist in quality control.* These inspectors closely and constantly check each operation during production. Their department, independently responsible to management, has full authority to stop any operation for correction when necessary.

QUALITY CONTROL begins outside of A. O. Smith. At the steel mill, A. O. Smith technicians cooperate with mill inspection and control. QUALITY CONTROL continues in A. O. Smith Metallurgical and Testing Laboratories. Finally, from the pickled plate to the shipping platform, it scrutinizes and checks every operation in the manufacture of the A. O. Smith pipe.

QUALITY CONTROL that never leaves the production line is yours at no extra cost when you choose A. O. Smith line pipe. Remember — QUALITY CONTROL is as important to A. O. Smith as it is to the customer. Through it we seek to better serve our customers.

Through research . . . a better way

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Here's why I have confidence in General

Confidence

This chart shows that when our contract is with General the percentage for successful exploration is in our favor. It shows completions, and you can see from it what happened when we started using General Geophysical Company. General's background in all phases of geophysical exploration qualifies them to do our work anywhere. Their knowledge, experience, accuracy and dependability are unsurpassed. I say, let's keep going with a winning team and continue to give our exploration contracts to General.

General GEOPHYSICAL COMPANY
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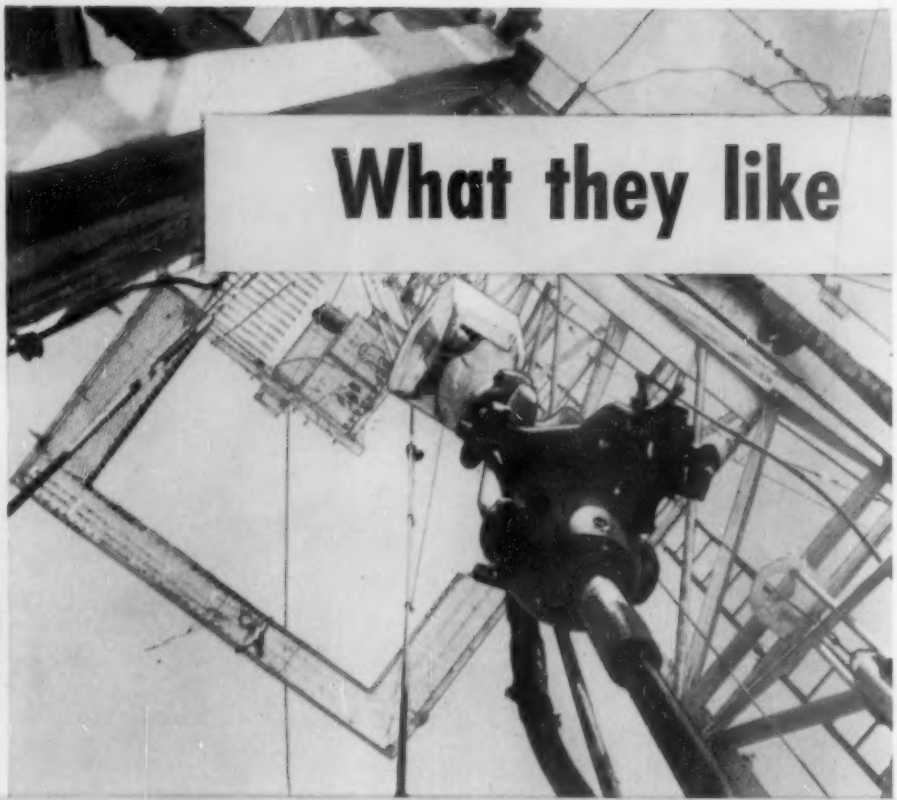
WHEN YOUR CONTRACT IS WITH GENERAL—THE PERCENTAGE FOR SUCCESSFUL EXPLORATION IS IN YOUR FAVOR.

What they like

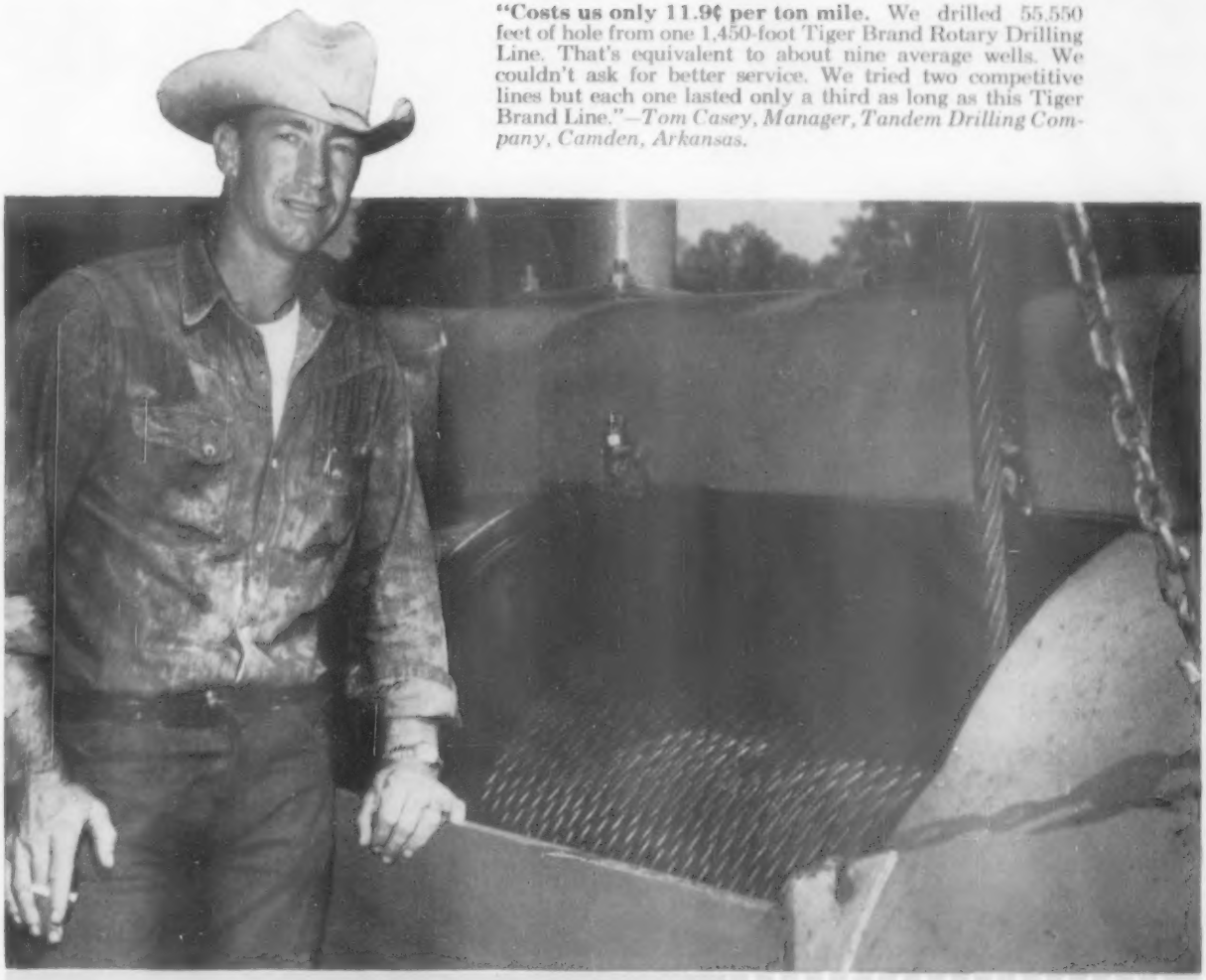
"When we find something good we stick with it. We experimented with various brands of line, and found that American Tiger Brand Lines gave us the best service. That's why we use American Lines in all of our wells."—*Mr. M. W. Brannon, President of Tri Service Drilling Co., Midland, Texas.*



"We won't use anything but Tiger Brand for drilling lines and winch lines. We find that Tiger Brand costs us less than any other make we've tried—regardless of price. That's because it lasts longer and gives us the best ton mileage."—*R. J. Moran, Vice President, Moran Brothers, Inc., Wichita Falls, Texas.*

about Tiger Brand Drilling Lines

"Costs us only 11.9¢ per ton mile. We drilled 55,550 feet of hole from one 1,450-foot Tiger Brand Rotary Drilling Line. That's equivalent to about nine average wells. We couldn't ask for better service. We tried two competitive lines but each one lasted only a third as long as this Tiger Brand Line."—*Tom Casey, Manager, Tandem Drilling Company, Camden, Arkansas.*



American Steel & Wire Division, United States Steel
General Offices: Cleveland, Ohio

Columbia-Geneva Steel Division, San Francisco
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TIGER BRAND WIRE ROPE
Excellay Preformed

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☐ Rush me one free Tiger Brand Ton Mile Calculator.

☐ Have your representative call to show me how this calculator can help me cut line costs.

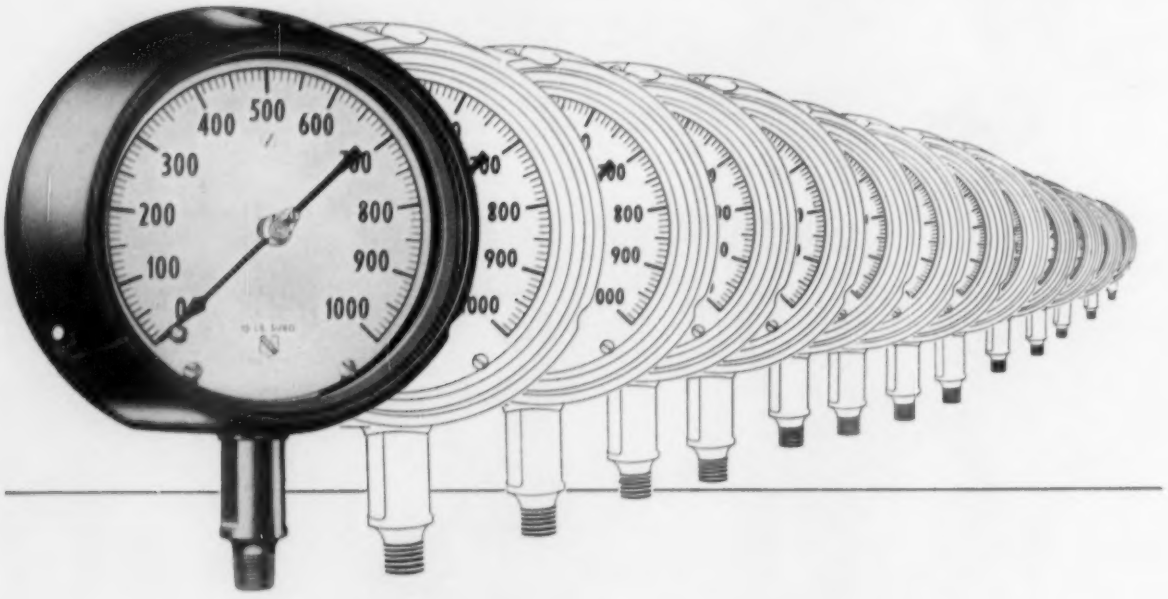
Name .....

Firm .....

Address .....

City & State .....

SATISFACTION MULTIPLIED
3x8x8x38x2x5



Service Conditions primarily determine the pressure gauge you specify for your installation. The wrong gauge can cost time, trouble, and money.

That's the big reason why Ashcroft Duragauges make sure of your complete satisfaction by offering a multiple choice in case designs and materials, Bourdon tube materials, ranges, movements, and dial sizes. Briefly, you can select the right gauge for your requirements from:

Cases of 3 different materials in 8 service-proved designs.

Bourdon Tubes of 8 different types of metals to meet specific service requirements.

Pressure Ranges from 30" vacuum or a few ounces through 100,000 psi.

Rotary Geared Movements that include the famous "Nylon Movement" or all stainless steel.

Dial Sizes from 4½" through 12".

Most important, Ashcroft Duragauges provide that unbeatable combination of highest sustained accuracy and durability of any pressure gauge built.

TAKE ADVANTAGE of the counsel of your nearby Industrial Supply Distributor. You can count on him to help you select Ashcroft Duragauges that will serve better and longer, with minimum maintenance, no matter how severe the conditions of vibration, pulsation, corrosion and weather.

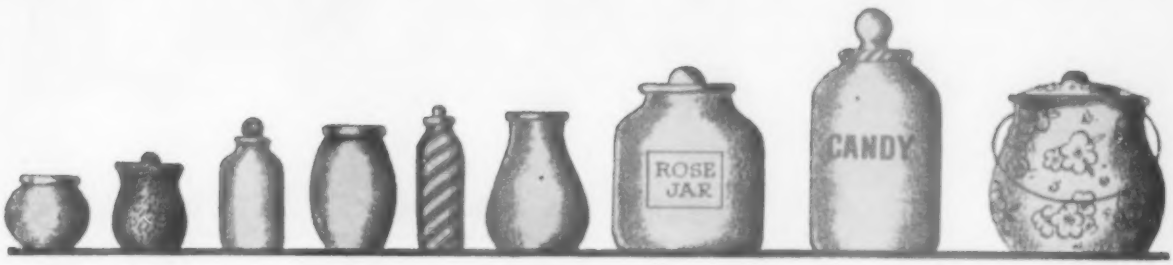
In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*

ASHCROFT GAUGES

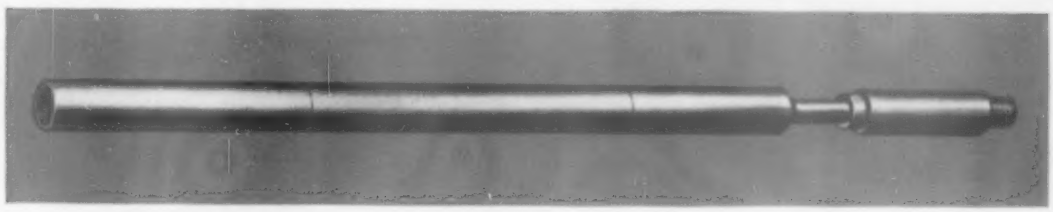
A product of **MANNING, MAXWELL & MOORE, INC.** STRATFORD, CONNECTICUT

MAKERS OF 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN-MICROSEN' INDUSTRIAL ELECTRONIC INSTRUMENTS, *Stratford, Conn.* 'HANCOCK' VALVES, *Watertown, Mass.* 'CONSOLIDATED' SAFETY RELIEF VALVES, *Tulsa, Oklahoma.* AIRCRAFT CONTROL PRODUCTS, *Danbury & Stratford, Conn. and Inglewood, Calif.* "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES, *Muskegon, Mich.*

there are all kinds of JARS!



but there's only one...



JOHNSTON-SUTLIFF HYDRAULIC JAR

WITH ANY EQUIPMENT, at any depth, you can depend on the Johnston-Sutliff Hydraulic Jar for fishing or any type of job where pipe or other equipment is stuck in the well.

HITS WITH ANY DESIRED INTENSITY at any time. A tap, a haymaker or an earthquake – to meet varying conditions *without coming out of the hole.* And it's available in all drill pipe sizes.

NEEDS NO TORQUE! This self-contained hydraulic tool assures easy, dependable operation since there are only two moving parts. Its value has been proven in reliable performance on drill stem testing jobs all over the world.

ASK YOUR JOHNSTON REPRESENTATIVE FOR MORE INFORMATION

JOHNSTON TESTERS

first in drill stem testing

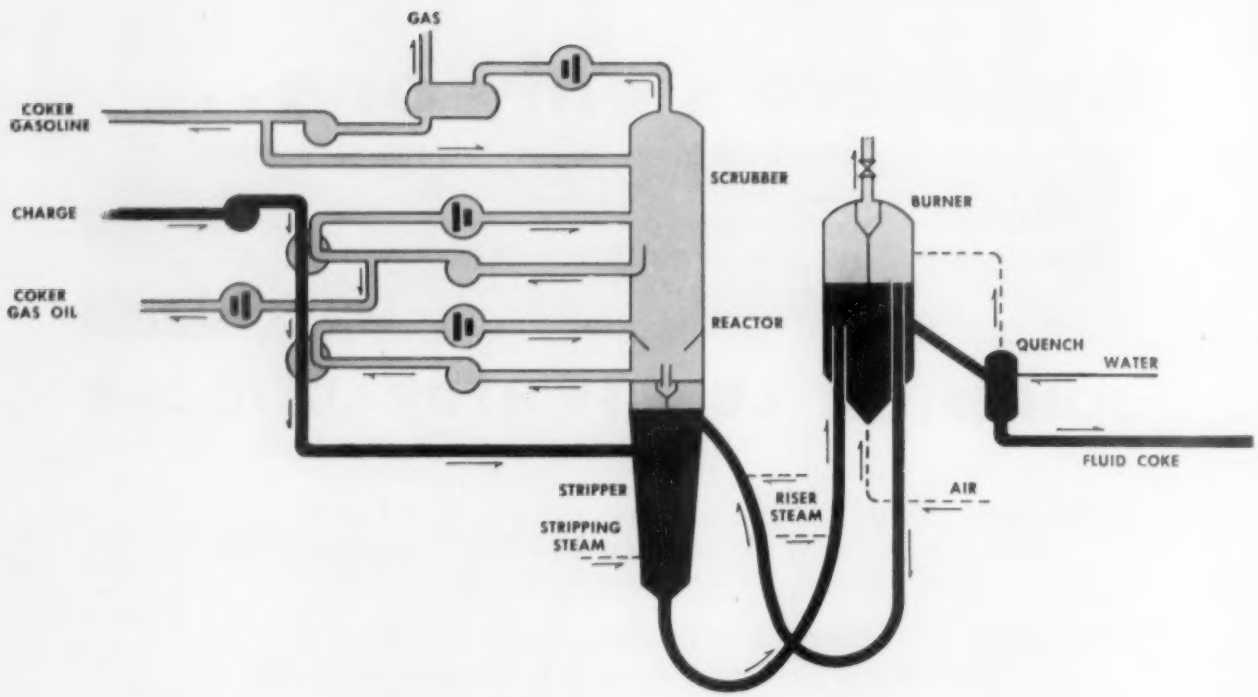
HOUSTON, TEXAS

J551 LOS ANGELES, CALIF. • CALGARY, CAN.

FORMATION AND CASING TESTING — JOHNSTON

fluid

its production...



IN THIS latest application of the fluidized-solids technique, developed by Esso Research and Engineering, heavy residua and asphalts can be converted to gas, oil and coke.

As shown in the flow diagram above, finely divided coke particles flow between two vessels—a burner and a reactor. In the burner, part of the coke stream is burned to supply the heats for vaporization, cracking and losses. When this hot coke meets the feed in the reactor, coking results and the liquid products are flashed off.

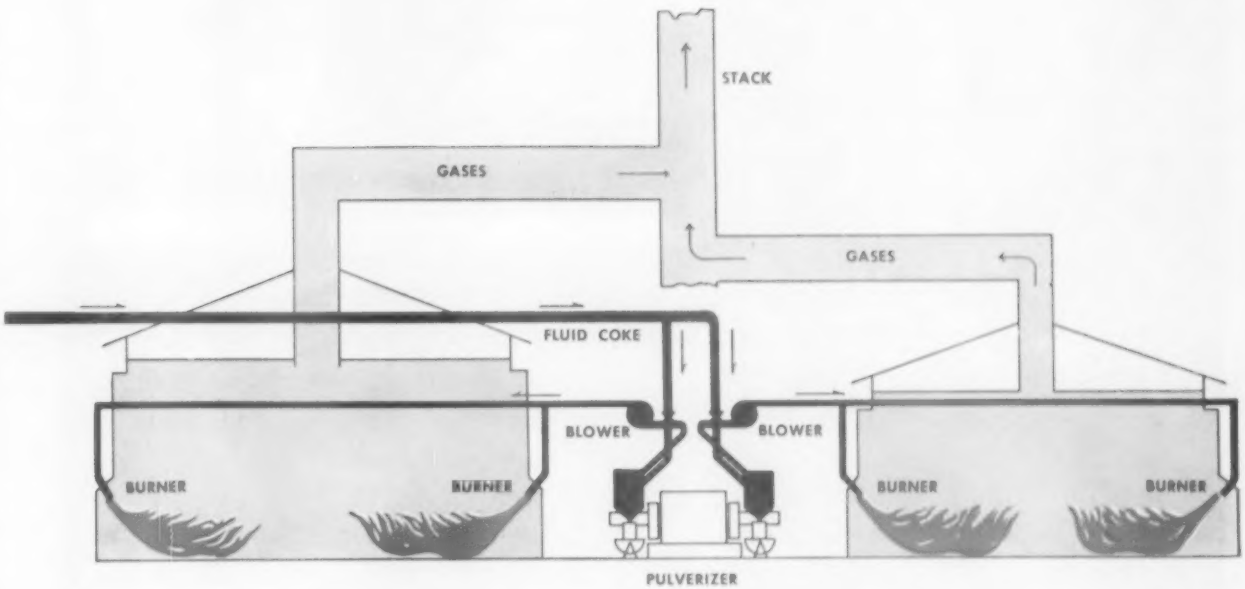
Coke particle size ranges between 75 and 150 microns and the coke itself is a clean, dustless solid. The feed is preheated through two fractionator (scrubber) pump-around systems. In the reactor it contacts the hot coke flowing from the burner. Coke is formed as the fluidized bed moves down into the stripper section where steam removes any remaining volatiles. The stripped coke then flows into the burner where, in contact with air, approximately 5 per cent by weight of the charge is burned. The coke inventory in the unit is fixed and the excess is removed as product coke which is cooled by water spray before flowing to storage.

The vapors from the reactor pass into the scrubber-fractionator section where they are separated into gas, gasoline and gas oil.

FOSTER

coke

...and utilization



THE USE of fluid coke as a fuel is illustrated in the above simplified diagram of two heaters designed by Foster Wheeler for a large oil company. They will supply the heat requirements for the atmospheric and vacuum sections of the highest capacity crude distillation unit in the world, having a combined heat absorption capacity of 336,400,000 btu per hour.

The pulverizers which reduce the particle size of the fluid coke before it is burned in the furnaces, as well as the pulverized coke burners, are also of Foster Wheeler design.

Designs are also available for the burning of fluid coke in steam generators.

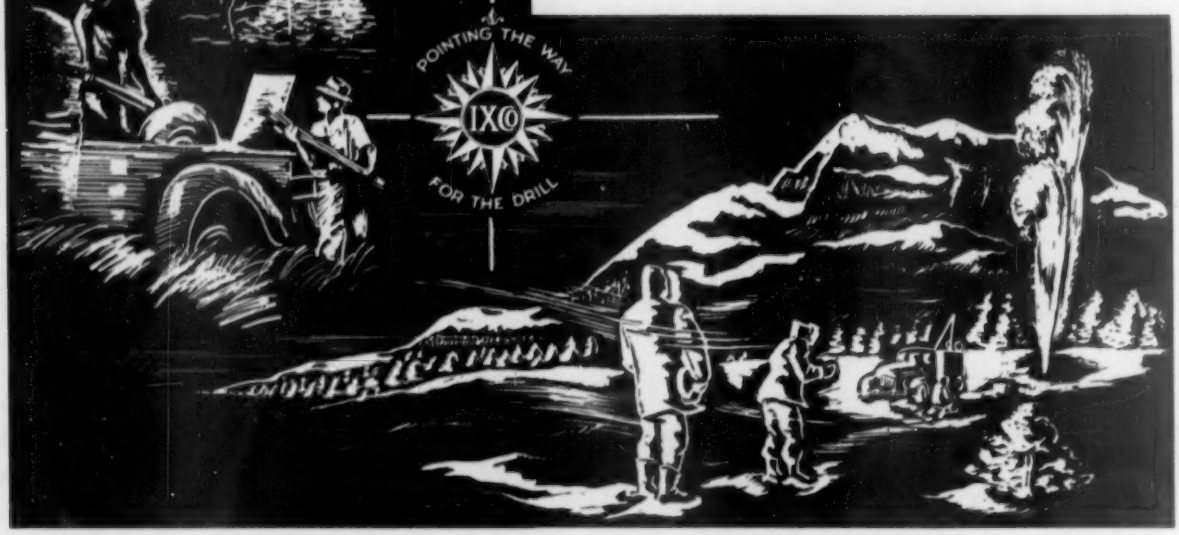
Foster Wheeler's experience in the design of equipment for both the *production* and *utilization* of fluid coke will be of value to any process plant interested in converting heavy residua into cracking stock and making effective use of the resulting solid fuel. For further details on this process, or for proposals to meet your specific requirements, write to *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

FW WHEELER

LONDON
NEW YORK
PARIS
ST. CATHARINES, ONT.

R. T. "Bob" Penny, Supervisor in the Mid-Continent and the Rocky Mountain Areas, is typical of IX executives. Having been with the company since 1939, Bob at one time or another has held practically every field job on an IX seismograph crew.

DERRICKS TODAY
Where I.X. Parties Were Yesterday



All Independent Exploration personnel—from the administrative level to working parties—are intimate with the requirements of a successful geophysical survey. This knowledge of field operations was gained in more than 22 years of intensive field work by men who, though now in executive positions, know the importance of a detailed, accurate survey. These men realize the value of prior planning for a survey and when to use time and cost saving "short cuts." This wealth of IX experience will guarantee you a better return from your survey investment.

Independent
EXPLORATION COMPANY
Geophysical Surveys

1973 West Gray, Houston, Texas

208 Dominion Bank Building, 8th Ave. & 1st St. East, Calgary, Alberta, Canada 39 Victoria St., London, SW 1, England

SHELL REPORTS

A PICTURE ROUNDUP OF SOME ACTIVITIES THAT MADE NEWS OUTSIDE THE PETROLEUM WORLD

A CAPITAL CONTRACT. To power its new turbo-prop Viscounts, Capital Airlines has selected Shell Oil Company as its supplier of fuel. Throughout flight history, as aeronautical engineers have built new engines and new planes, Shell research has developed the fuels to fly them. Shell Oil Company, leading supplier of aviation fuels to the United States commercial airlines, is helping turbo-prop travel become available for everybody.

ROCK AGER. What Mother Nature takes 10 million years to accomplish, Shell's atom smasher completes in one week. Behind thick walls, particles of rock are bombarded with radiation and thus aged by the first 2-million-volt Van De Graff accelerator in the petroleum industry. In this way, members of Shell's Exploration and Production Research Division are learning more about the age of rock and the origin of oil. Shell's advanced techniques in oil research are a strong investment in today to provide for tomorrow.

HITTING THE ROAD. It's the new method developed by Shell to measure the load-carrying capacity of asphalt. Electronic impulses simulate the jarring effects of traffic, and record the effects of continuous vehicular movement. Without damaging the highways, engineers get a long-range picture of how much a road can take. Shell's research is a step towards a better understanding of road requirements — and to more efficient, longer-lasting highways in the future.

SHELL

WHERE OIL WELLS BEGIN . . .

This is a picture of a part of the Oil Department at Republic. Behind long lines of doors to the right and left is a complete staff of experienced oil men, engineers and geologists.

Behind *them* is the financial strength and the oil "know-how" of one of the first banks to make Oil Production Loans. Production loans originated here have helped add billions of barrels to the nation's oil and gas reserves — and have made the Republic "*The* Oil Bank" to oil men all over America.

This is YOUR Republic
Call it "My Bank"

REPUBLIC
NATIONAL BANK of Dallas

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

CAPITAL AND SURPLUS $60,000,000
LARGEST IN THE SOUTH

The Financial Center of the Southwest

TIMKEN® SEAMLESS STEEL TUBING 50% STRONGER THAN HIGHEST API GRADES...

No well yet drilled can fully test its strength

TIMKEN® seamless steel tubing for deep or high pressure wells can withstand internal pressures up to 15,000 psi. It is so strong that present wells can't extend its strength to proven test limits—strong enough for the deepest wells even contemplated today!

While the strongest grade in API specifications—5A—calls for only 80,000 psi yield strength, Timken steel tubing can be furnished with a yield strength up to 125,000 psi.

Timken seamless steel tubing is furnished in a wide variety of sizes and analyses. Some analyses are specially selected for corrosion resistance, all are ductile when properly heat-treated.

The Timken Company has already supplied tubing for many extremely deep or high-pressure wells, with completely satisfactory results. And oil and gas well applications only scratch the surface of our experience with high-pressure seamless tubing. For over 24 years we have been making tubing for many other special requirements.

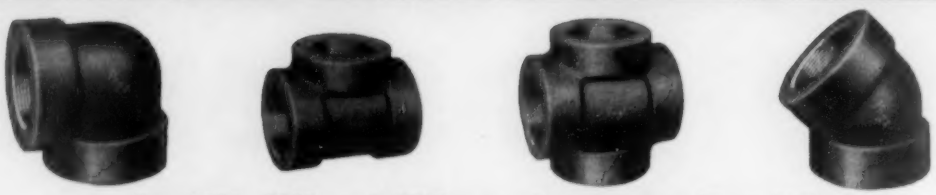
FREE ENGINEERING STUDY. A recent study by Timken Company metallurgists discusses various alloys for high-strength and corrosion-resistant tubing, and their physical properties. Write for your free copy of "Timken Oil and Gas Well Tubing" to: The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

STRENGTH

for Safety and Long-Time Service



For 2000, 3000 and 6000 pounds service — Sizes 1/8" to 6"

SCREW END TYPE

For schedules 40, 80 and 160 pipe — Sizes 1/8" to 4"

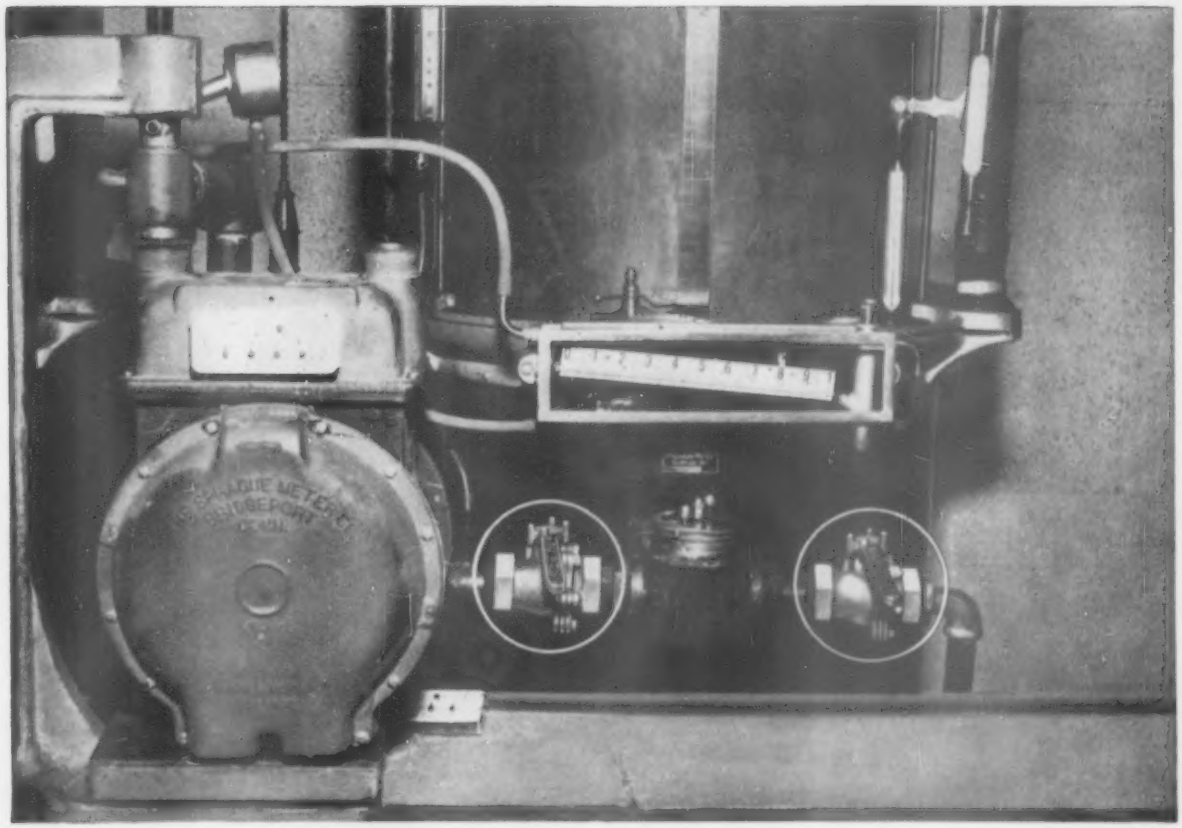
SOCKET WELD TYPE

Vogt Ells, Tees, Crosses, etc., are forged from carbon steel or various alloys to meet specific operating conditions. Catalog F-9 will aid you in their selection and proper application.

Shocks and stresses imposed by high pressures and high temperatures are taken in their stride because Vogt fittings are uniform in structure, fine grained, and free from porosity . . . the superior product of laboratory controlled materials and giant forging hammers and upsetters. These properties also give higher resistance to erosive and corrosive conditions, thereby adding to service life expectancy in steam plants, petroleum refineries, chemical plants and related industries.

HENRY VOGT MACHINE CO., INC.
Louisville 10, Kentucky
BRANCH OFFICES: NEW YORK • PHILADELPHIA • CLEVELAND • CHICAGO • DALLAS

Vogt DROP FORGED STEEL FITTINGS



Handling Air Under Pressure – These Valves Open, Close . . . 1000 times a day!

The Sprague Meter Company, Bridgeport, Connecticut, uses Rockwood Ball Valves in air lines testing gas meters.

One thousand times a day, the valves are opened and closed. Yet they have completed two years' steady service without leakage, without maintenance!

This leakproof trouble-free performance is typical of the way in which Rockwood Ball Valves handle everything from L. P. G. to pickling acids, alcohol to asphalt. Used throughout the petroleum field, their efficiency stems from these four exclusive features —

Full Round Flow — no change in shape or volume of fluid stream — no turbulence — no minimum loss

Quick Opening and Closing — only a quarter turn needed

Longer Wear-Resistance — chrome-plated bronze ball withstands abrasion, pitting and scratching

Leakproof Seal — pressure of fluid automatically positions ball against seat to form tight seal.

If you are not now using Rockwood Ball Valves, send coupon today for complete information. Valves come in all pipe sizes. Tested and listed by Underwriters' Laboratories, Inc.

ROCKWOOD BALL VALVES

ROCKWOOD SPRINKLER COMPANY
762 Harlow Street
Worcester 5, Mass.

Send me illustrated folder V-4 on Rockwood Full-Flow Ball Valves.

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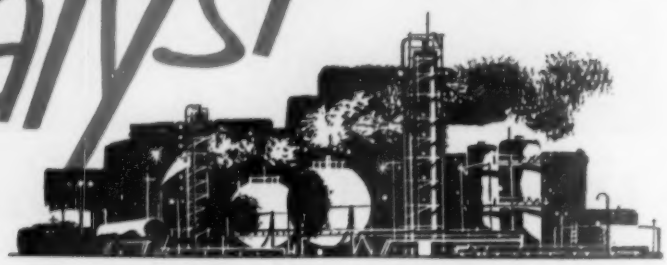
Davison M-S®

HIGH ALUMINA Catalyst



DAVISON GIVES YOU HIGH ALUMINA CATALYST IN THE PARTICLE SIZE BEST SUITED FOR YOUR UNIT!

HIGH ALUMINA M-S CATALYST PARTICLE SIZE DISTRIBUTION

The catalyst with a minimum of fines . . .

Grade	F-3-25 Extra Fine	F-2-25 Fine	F-1-25 Inter-mediate	C-1-25 Coarse	C-2-25 Extra Coarse
Size range by C.A.E.: Wt. %					
0-10 Microns	4	2	1	1	1
0-20 Microns	9	4	2	2	2
0-30 Microns	16	11	6	5	4
0-40 Microns	28	21	12	10	8
. . . and a minimum of coarse particles					
Sieve analysis: Wt. %					
on 100 mesh (149 microns)	0	0	1	1	1
on 140 mesh (104 microns)	1	1	4	6	8
on 200 mesh (74 microns)	4	5	15	22	33

Now Davison has taken the characteristics of High Alumina Catalyst and combined them with the proven advantages of its 13% Alumina Catalyst. This gives you, for the first time, High (25%) Alumina Catalyst with *all* these qualities:

- ***Lower Stack Losses***
- ***Better Maintenance of Activity and Surface Area***
- ***Narrow Particle Size Distribution***
- ***High Attrition Resistance***
- ***High Purity and Uniformity***

For information on Davison High Alumina Catalyst see your Davison Representative or write.

Progress Through Chemistry

DAVISON CHEMICAL COMPANY

Division of W. R. Grace & Co.

Baltimore 3, Maryland

Sales Offices: Chicago, Ill.; Houston, Tex.; New York, N. Y.; Baltimore, Md.

PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, TRIPLE SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS AND SILICOFLUORIDES. SOLE PRODUCERS OF DAVCO® GRANULATED FERTILIZERS

BEAIRD-INGERSOLL-RAND
Packaged Compressor Plant

Lowest Cost Per Horsepower Installed

ROWAN AND HOPE installed a compressor station at its Sweetwater gasoline plant to convert to profit flare gas from nearby Nolan County Wells. Upon recommendation of the design engineer, the station was equipped with a 10SVG 550 h.p Beaird-Ingersoll-Rand packaged compressor plant. Picking up 2,500,000 cubic feet of gas daily from the wells at 5 psig, the unit operates with three stages of compression. As the gas leaves each stage, it is cycled through the plant for processing. Finally with both gasoline and LP-Gas removed, the residue is delivered to the sales line at 525 psig.

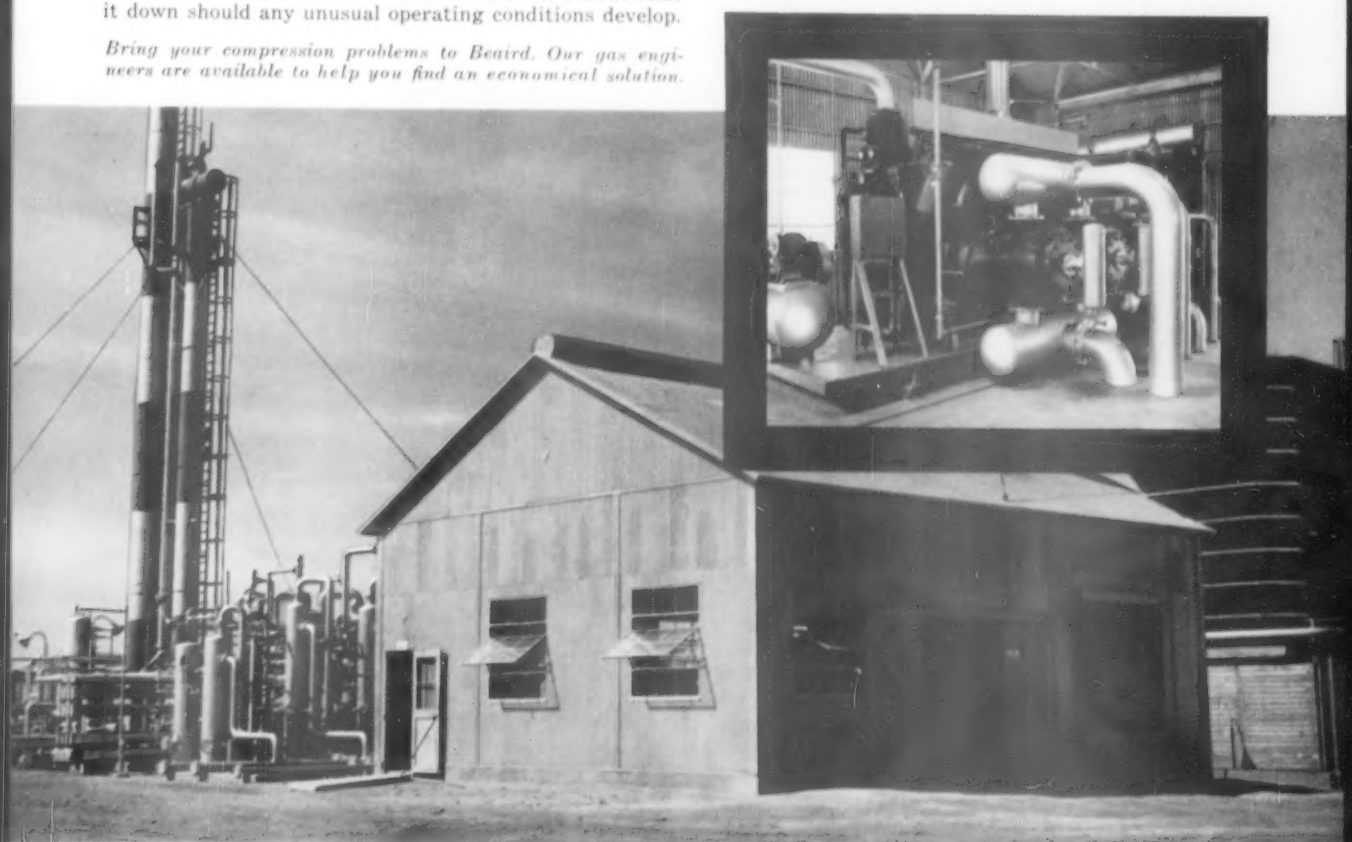
Rowan and Hope have found the unit to be exceptionally economical. Definite savings in both time and cost of installation were realized by the shipment of the compressor plant, fully assembled, directly to the Sweetwater location. And in 15 months of continuous service it has been down only a few hours. In each instance, the trouble has been of a minor nature.

Designed for unattended operation, the unit is equipped with automatic controls that permit it to speed up or slow down while maintaining constant processing pressure and volume. Other special controls watch over the unit to shut it down should any unusual operating conditions develop.

Bring your compression problems to Beaird. Our gas engineers are available to help you find an economical solution.

Packaged Compressor for —

"VEST POCKET" GASOLINE PLANT



Rowan and Hope compressor station, Sweetwater, Texas—equipped with a Beaird-Ingersoll-Rand 10SVG 550 h.p. Four Cycle gas engine driven compressor, Young radiator and all necessary equipment and controls. Other sizes 110 to 660 h.p.

THE J. B. BEAIRD COMPANY, INC.

Shreveport, Louisiana

BEAIRD

MACHINING • MANUFACTURING • STEEL WAREHOUSE

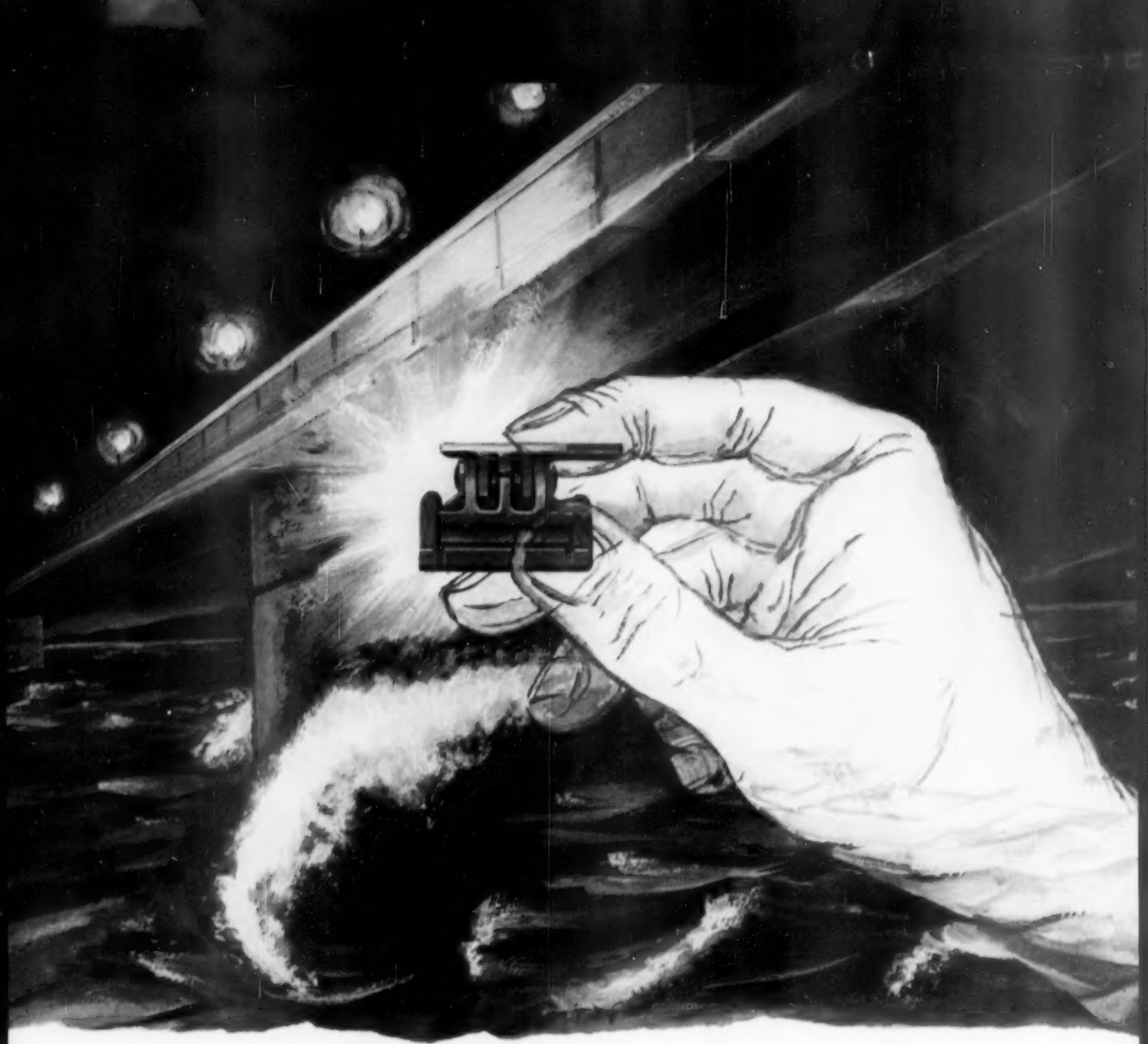
PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS



SHOES for a bridge that walks

LITERALLY PACING BACK AND FORTH on its foundation as it reacts to heat and cold, this giant bridge across the Red River was fitted with massive shoes of steel — made by Beaird's machining division. Well known in the oil and gas industries for packaged compressor plants, pressure storage vessels and cast steel fittings, Beaird has an equally wide-spread reputation as a dependable source for contract machined and fabricated parts and sub-assemblies.

The walking bridge is only one of the many engineering achievements that Beaird's versatile machining division is helping to build. One of five manufacturing divisions at Beaird, the machining division brings to its customers the integrated resources, facilities, experience and skills of all five Beaird manufacturing divisions.

Let us show you how Beaird can offer you dependable production on your product . . . at lower cost . . . by writing The J. B. Beaird Company, Inc., Shreveport, Louisiana.

PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS

BEAIRD

MACHINING
STEEL WAREHOUSE
FABRICATING

CHIKSAN takes a Compressor's Pulse

Keeps Gas Flowing— Absorbs Vibration of Changing Pressures

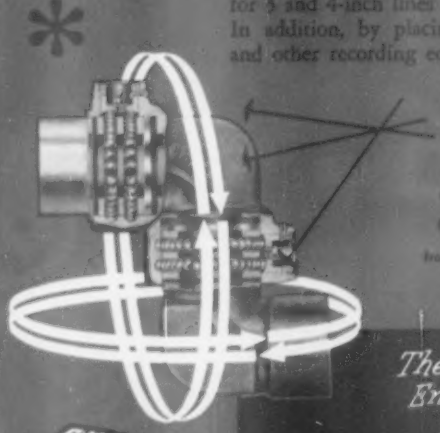
Not only do the stamina and flexibility of Chiksan Joints take expansion in their stride, they absorb pulsation and vibration. When the Plymouth Oil Company wanted a better way to handle the expansion and contraction of its 2500-3500 lb. natural gas re-pressuring line in its compressor station in Sinton, Texas, back in 1946, it tried Chiksan 2-inch high pressure ball bearing swivel joints. So successful were Chiksan Joints in this application, they were adopted for 3 and 4-inch lines for the same purpose. In addition, by placing regulators, gauges and other recording equipment on a bridge using Chiksan Joints, accurate readings of the instruments could be obtained.

Since 1946, not one of these Chiksan Joints has been replaced or even repacked, and they are giving the same economical, dependable service they did when first installed.

In Texas or California — all over America and all around the world — wherever production, processing or distribution depends on the flow of liquid or gas or on the dependability of hydraulic systems, there you will find Chiksan Ball Bearing Swivel Joints on the job — adding muscle and flexibility — cutting down on shut-downs and maintenance.

Whatever your business, if gas or liquid plays a part, Chiksan's Research and Development Division can help you add efficiency, safety and economy to your operation.

Representatives in Principal Cities
Write for Catalog 53-C, Dept. OGJ-7



CHIKSAN Ball Bearing Swivel Joints are THE NEW TOOL of Modern Industry — with full 360° rotation in 1, 2, and 3 planes. Over 1,000 different types, styles and sizes have been developed for pressures and services from 28" vacuum to 15,000 psi and for temperatures ranges from minus 75° to plus 900° F., with packing materials for each specific type of service.

The Flow of Enterprise Relies on **CHIKSAN** *Ball-Bearing Swivel Joints*

CHIKSAN COMPANY • BREA, CALIFORNIA • Chicago 28, Illinois • Newark 2, New Jersey

He takes oil's measure . . . He's called a gauger. He's one of the few oilmen who actually *see* oil. He works among the huge tanks where it's constantly moving in and out. His job is to keep a running check on those tanks. How much oil do they hold right now? How much came in today? What went out? Those are some of the questions he has to answer. It's a busy job, and it's an important one. He helps record how *much* oil there is—and *where* it is—every minute. Because that's one sure way *we're* sure of keeping a steady stream of Texaco Products flowing to the people who use them in all 48 states.

The Texas Company

TEXACO

How to avoid Split Responsibility

when planning and purchasing an offshore drilling rig

One of the most bothersome problems in buying offshore drilling equipment is the divided responsibility involved. Obviously, if the platform is bought from one source, the drilling machinery from others, and the miscellaneous equipment from still others, there is ample opportunity for confusion, headaches, and costly errors.

All this can be avoided by placing the complete job in Bethlehem's hands.

Through the combined services of Bethlehem Supply Company and the Shipbuilding Division of Bethlehem Steel, it is possible to obtain your *complete* offshore drilling rig from one highly responsible source. When you place the order in our hands, you avoid the worries and mixups that a "split" job always involves. And you are assured of the finest equipment that can be built today—top quality from crown block to the bottom of the hole.

Behind Bethlehem's organization is a wealth of experience in building drilling machinery, stationary and mobile platforms, drilling barges, and allied equipment. Our engineers are well able to cope with problems of this nature, and they can work in complete harmony with your own headquarters staff. You are invited to consult with them freely when planning future offshore drilling installations.

The Bethlehem 1013 for Deep Marine Drilling

Bethlehem's 1013 is a heavy-duty drawworks designed for deep-drilling operations. It is a smooth, efficient unit with extra-capacity clutches, extra-heavy shafts and brakes. Clutches are the air-friction type—a feature contributing to speed of operation. Compounds and engine drive groups can be furnished for mechanical drive, hydraulic torque-converter, hydraulic couplings, or electric couplings.

Write for complete information about the 1013—or better still, let us go over the unit with you. It's the perfect rig for an offshore platform set-up.

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BETHLEHEM STEEL

General Offices: 21 E. Second St., Tulsa, Okla.
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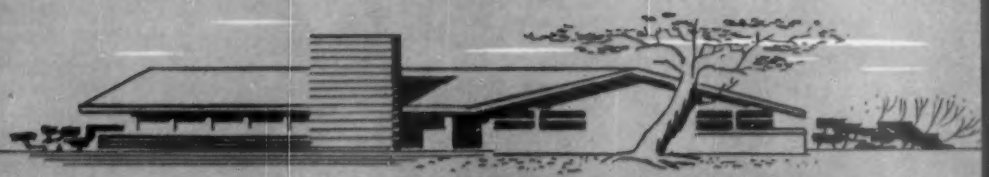
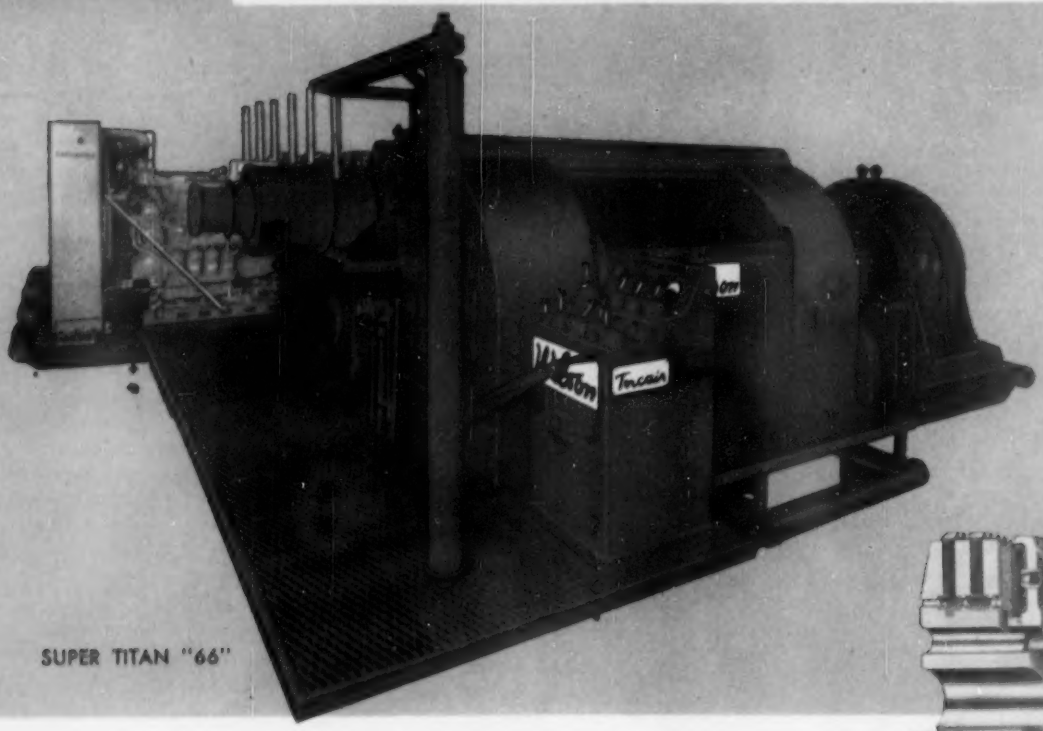
A JAW CLUTCH RIG IS OBSOLETE

DON'T BUY AN OBSOLETE RIG!

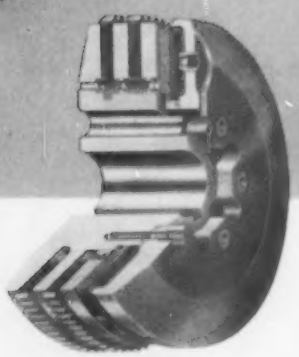


BE MODERN-BUY WILSON!

THE ALL FRICTION CLUTCH DRIVE COMPOUND RIG



SUPER TITAN "66"



AIR TUBE
DISC CLUTCH

Wilson Giant, Atlas, Titan and Super Titan Rigs use Air-Tube Disc Clutches in the compound, transmission and drum drives. You do not have to stop Wilson Rigs to change speeds. Why worry with an obsolete jaw clutch transmission? Wilson built the first chain drive jaw clutch transmission in 1934. All other rig transmissions are copies of the original Wilson. Now Wilson has gone forward again, and has discarded the jaw clutch transmission on compound rigs. Look to Wilson, the true pioneer in the power rig field, for the real improvements. BE MODERN — BUY WILSON! REMEMBER — RED IRON ELIMINATES RED INK!

Wilson

The FIRST NAME in DRILLING RIGS!

WILSON MANUFACTURING CO., Inc.

The Home of RED IRON • Wichita Falls, Texas

it's this easy...

and it lasts...and lasts...and lasts

Yes, Rex Oil Field Roller Chains are remarkably easy to take apart and assemble...yet they last...and last...and last.

To take the chain apart, just drive the pins the thickness of one outer side plate and pull them through the rest of the chain. AND, due to revolutionary pitch control system, the load is distributed equally over all chain parts. There is no chance for the load to be concentrated on a single side plate with resultant early failure of the plates. Pin holes in inner pin link plates have been greatly strengthened to prevent fatigue cracks.

Get the complete story from your local supply store or write for your copy of Bulletin No. 55-3. Chain Belt Company, 4619 W. Greenfield Avenue, Milwaukee 1, Wisconsin. Oil Field Offices: Dallas, Houston, Midland, Los Angeles, New York, Tulsa. Oil Field Warehouses: Dallas, Houston, Los Angeles.

CHAIN BELT COMPANY

Confidence...

Breeds On Satisfactory Experience!

Record Sales Prove That Oilfield Production Men Everywhere Have Confidence In BS&B Equipment!

Confidence is not something that is given freely . . . nor can it be bought with rash promises backed by slipshod performance!

Where it concerns oilfield production equipment, Confidence is something that must be *earned* by well-kept promises backed by *actual field performance* as good or better than anticipated. In short, Confidence breeds on satisfactory *experience!*

During our more than 60 years of service to the industry, BS&B has become one of the world's leading manufacturers of oilfield production equipment and has won the Confidence of Oilfield Production Men the world over by delivering equipment that is unsurpassed for efficiency and reliability. Next time, buy BS&B . . . and see!

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Equipment Division,
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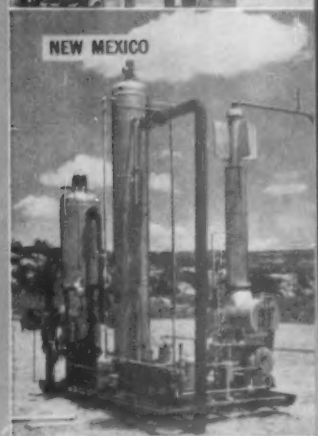
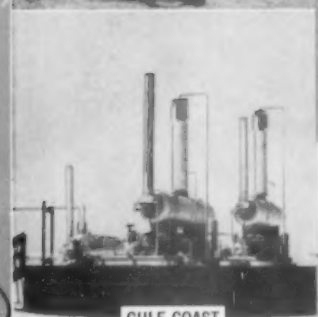
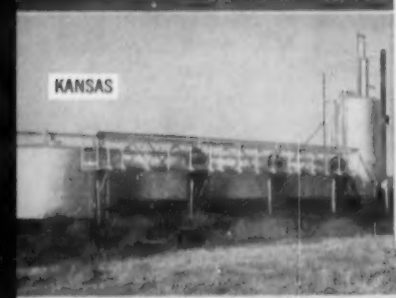
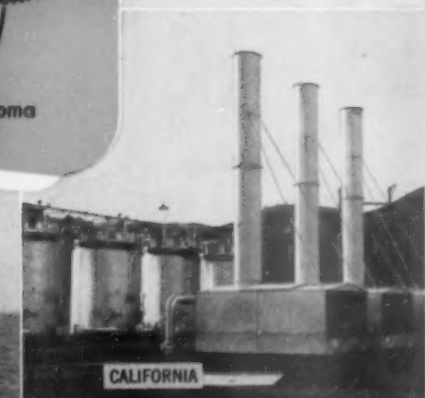
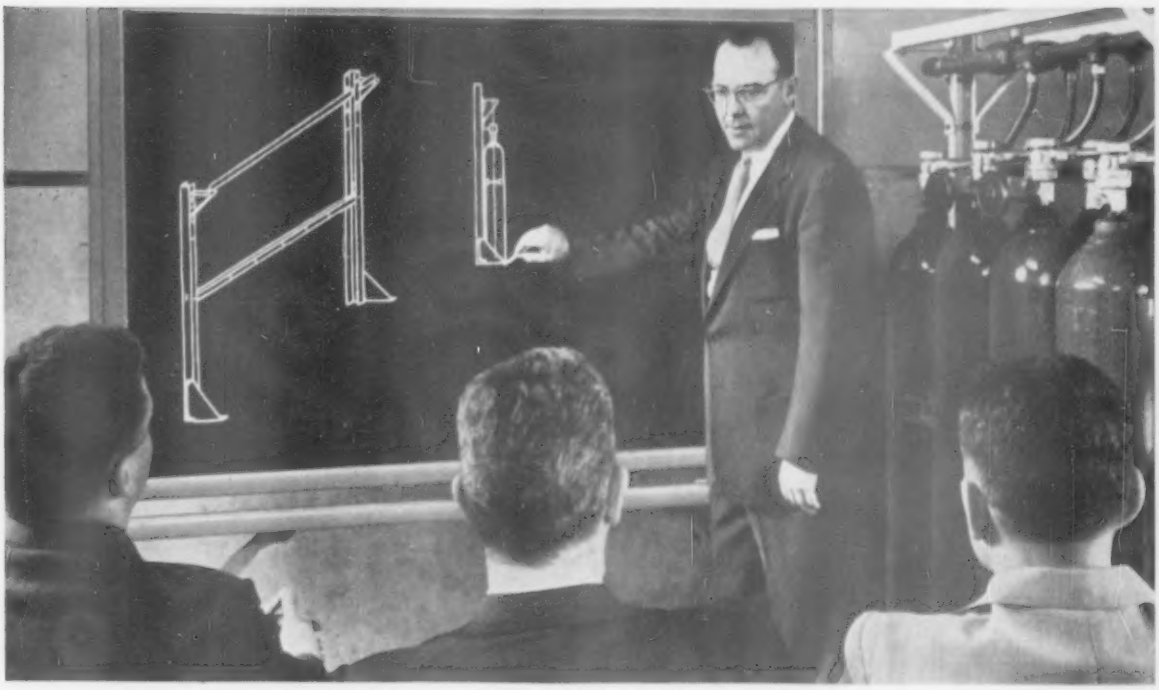








GREATEST FIRE FIGHTING DESIGN ADVANCE IN 25 YEARS!



This Kidde Automatic Pressure-Operated CO_2 Extinguishing System is *brand new from the floor up!*

✓ CHECK THESE 10 FEATURES!

☐ **1.** NO FALLING WEIGHTS – No clumsy mechanical triggering methods. Pneumatic or Electrical Control Heads automatically trigger CO_2 cylinders, assure complete discharge!

☐ **2.** SELF-ENCLOSED PARTS – All moving parts of the new Kidde system are self-enclosed to prevent fouling or accidental operation!

☐ **3.** EASIER INSTALLATION – New racking arrangement is pre-drilled at the factory, eliminates need for special hangers, tools or outside material! Can be either "free standing" or wall mount.

☐ **4.** NO PARTS TO REPLACE – Even after a fire, operating parts of the new Kidde system can be re-set with a screwdriver. No parts need be replaced. Refill cylinders and system is ready for operation!

☐ **5.** SIMPLE, THOROUGH TESTING – By merely disconnecting control heads from cylinders, *all* operating parts (other than actual discharge of CO_2 gas) can be tested *in place!*

☐ **6.** QUICK VISUAL INSPECTION – All primary actuating parts fitted with easy-to-read visual indicator. Shows at a glance if system is "set" or "released."

☐ **7.** MULTIPLE PROTECTION – Automatically-operated Directional Valves let you protect more than one hazard from the same bank of cylinders!

☐ **8.** SIMPLIFIED WEIGHING – New racking arrangements lets you weigh CO_2 cylinders right in place without disconnecting them, providing uninterrupted fire protection even while cylinders are being weighed!

☐ **9.** NO OUTSIDE POWER NEEDED – The new Kidde system is completely self-contained, has rate-of-temperature-rise detectors which give sure protection even in case of outside power failure!

☐ **10.** AUXILIARY EQUIPMENT – Also available for use with the new Kidde system are devices for turning power on or off, for opening or closing doors, windows, dampers, etc.

Fully approved by Underwriters' and Factory Mutual Laboratories. Complete details of this revolutionary new system are contained in Kidde's Pressure-Operated System Booklet. Write for your copy today!

Kidde

The words 'Kidde', 'Lux', 'Lux-O-Matic', 'Fyre-Freez' and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

Walter Kidde & Company, Inc., 754 Main Street, Belleville 9, N. J. • Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

he knows how to take the whether out of weather!

Weather proof! — How important it is to be able to say: my factory . . . farm . . . ranch . . . city . . . is weather proof. Layne knows how to take the *whether* out of weather. Layne has removed the fear of drought and resulting shortage of water supply for thousands of municipalities — large and small — for leading industries — for farmers and ranchers all over the world.

To take the *whether* out of weather — "ask the man from Layne."

LAYNE & BOWLER, INC.
General Offices
Memphis 8, Tennessee

Layne Associate Companies Throughout the World

water wells • vertical turbine pumps • water treatment

Layne

THE *FORWARD* LOOK ...IN TRUCKS!

Dodge has changed the picture on performance, price!

Today there's a changed picture of truck power, payload, price! For example, do you know the answers to these 3 questions?

1—What trucks provide the highest horsepower of the 5 leading makes *in every conventional model*, ½-ton through 3½-ton?

2—What trucks have the highest payload in more models, 1½- through 4-ton, than any other leading make?

3—What trucks have the lowest factory retail price in more popular models than any other leading make?

In each case the answer is, "Dodge '*Job-Rated*' trucks" . . . the trucks with the Forward Look! Find out for yourself how Dodge trucks give you more visibility, more modern styling, more of everything you want in a truck. See your dependable Dodge Truck dealer now.

ALL-NEW

DODGE

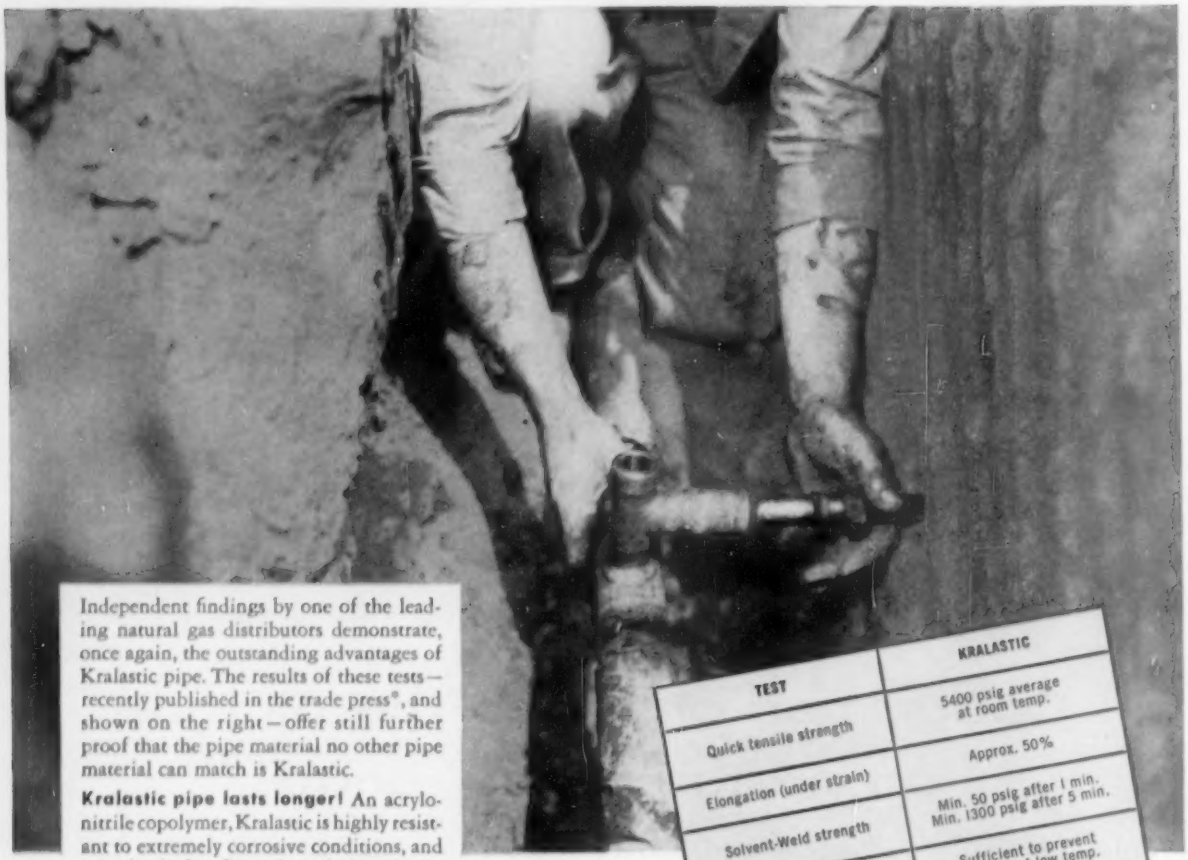
"Job-Rated"

TRUCKS

PRODUCTS OF CHRYSLER CORPORATION

Gas Company's tests prove

Superiority *of* Kralastic *pipe!*



Independent findings by one of the leading natural gas distributors demonstrate, once again, the outstanding advantages of Kralastic pipe. The results of these tests—recently published in the trade press*, and shown on the right—offer still further proof that the pipe material no other pipe material can match is Kralastic.

Kralastic pipe lasts longer! An acrylonitrile copolymer, Kralastic is highly resistant to extremely corrosive conditions, and completely free from electrolytic action.

Kralastic pipe is easy to handle—easy to install! Kralastic pipe lends itself to snaking through existing lines, eliminating costly, time-consuming labor. Solvent welds can be made and tested in minutes, and because Kralastic is lightweight, one man can carry all that's necessary for the average home service.

Kralastic pipe is easy to maintain—exhibits no scale or interior build-up—is unharmed by alcohol or methanol frequently used to clear freeze-ups.

The first rubber-resin to produce successful plastic pipe, Kralastic has proved its unmatched advantages for carrying natural gas, brine, oil, water, and for many other applications. For additional information on how Kralastic® pipe can economically serve *you*, and for your copy of the test report, write to us, today.

*Gas Age, Oct. 7, 1954—Plastic Pipe Is Gaining Approval.

TEST	KRALASTIC
Quick tensile strength	5400 psig average at room temp.
Elongation (under strain)	Approx. 50%
Solvent-Weld strength	Min. 50 psig after 1 min. Min. 1300 psig after 5 min.
Elasticity	Sufficient to prevent pull-out at low temp.
Effect of alcohols and methanol	Very slight
Accelerated corrosion (buried in moist spent oxide)	No trace
Exposure to weather (after approx. one year)	Tensile = 20% above new Elongation = 20% below new

Naugatuck Chemical

Division of United States Rubber Company
Naugatuck, Connecticut

US RUBBER

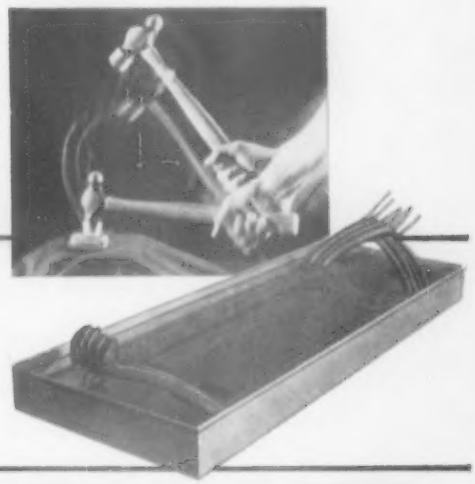
BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • Memphis • New York • Philadelphia
IN CANADA: Naugatuck Chemicals, Elmira, Ontario • Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N.Y.

NEW Silco-Flex MOTOR INSULATION

Offers These Amazing Physical Properties

Allis-Chalmers, working with Dow Corning Corporation, has developed *Silco-Flex* motor and generator insulation . . . truly new in concept . . . truly new in effectiveness.

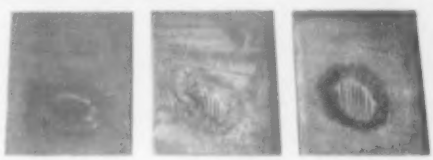
Silco-Flex insulation employs a pure silicone rubber combined with specially developed application techniques to produce an insulation unmatched by any other in use today.



● **Flexibility and Resilience** — *Silco-Flex* insulation remains flexible and resilient indefinitely. It is especially resistant to mechanical abuse and to stresses of overloading, rapid starting and stopping.

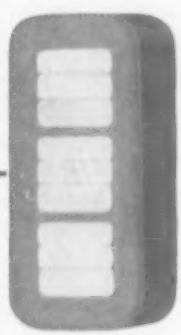
● **Moisture Resistance** — Completely sealed, *Silco-Flex* insulated coils are the most moisture-resistant commercial coils ever produced. They are production-tested while submerged in water . . . by far the most complete and searching high potential test used.

● **Abrasion Resistance** — Samples of insulation at right show effects after sandblasting with 90 grit aluminum oxide and 100 psi air for one minute. Nozzle-to-sample distance was six inches, thickness equivalent to 2300-volt insulation. Note difference in abrasion!



Silco-Flex Insulation | Polyester Mica Tape | Asphaltum Mica Tape

● **Homogeneity** — *Silco-Flex* insulation is a void-free dielectric barrier vulcanized into a unified insulating wall. It maintains its homogeneity under extremes of differential expansion and contraction due to thermal cycling.



Other Advantages include exceptionally good thermal stability and chemical inertness. *Silco-Flex* insulation is also a much better heat conductor than ordinary electrical insulating materials. Moreover, enclosures now required to protect windings from moisture and abrasion may be eliminated in many cases.

New *Silco-Flex* insulation is immediately available for all Class H form-wound coils and for Class A and B windings operating under selected service conditions. For complete information, call your Allis-Chalmers representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4774

Silco-Flex is an Allis-Chalmers trademark.

ALLIS-CHALMERS

Adjustable Crank

Cabot

CABOT units have a universal base with easily interchangeable extensions to accommodate any prime mover.

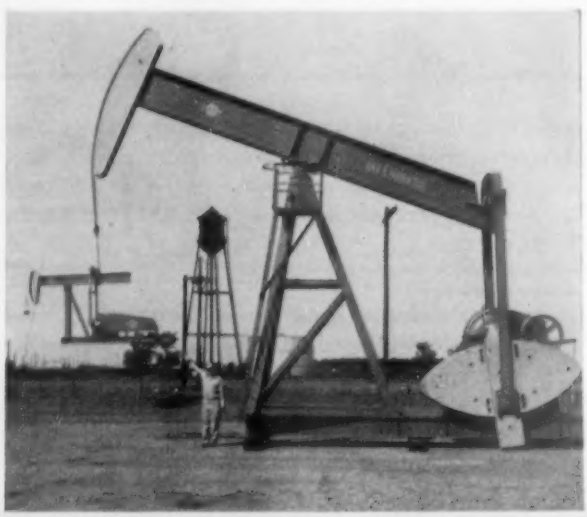
The one-piece reducer case houses the finest gears, shafts and bearings known to the industry. There are no oil seals. The reducer carries a five-year service guarantee that is valuable to the user.

The derrick-type sampson post is made of heavy angles with well-designed bracing members, boxed in at the top with steel plates.

It is never necessary to remove the walking beam to service a well equipped with a CABOT. Clearance has been increased by newly designed horseheads.

Floor-clearing bases, Vee belts, belt guards, reducer oil, and adjustable slide rails are standard equipment.

Here, for comparison, are CABOT'S largest and smallest units. The small unit is from the Beam Balanced Type B Series (limited crank counterweighting optional) rated from 3,000 to 11,000 pounds beam rating.



113 M

Pumping Units

built to serve best the man who owns the well!

Seventeen years ago CABOT engineered a line of pumping units to cut costs and minimize maintenance problems for producers.

CABOT units, built strictly to API standards, sell to the most exacting producers in the United States and Canada.

The Adjustable Crank Type AC series starts with a unit beam rating of 9,000 pounds, and a 40,000 in-lbs. reducer rating. The series includes a unit with a beam rating of 32,000 pounds and a 456,000 in-lbs. reducer rating.

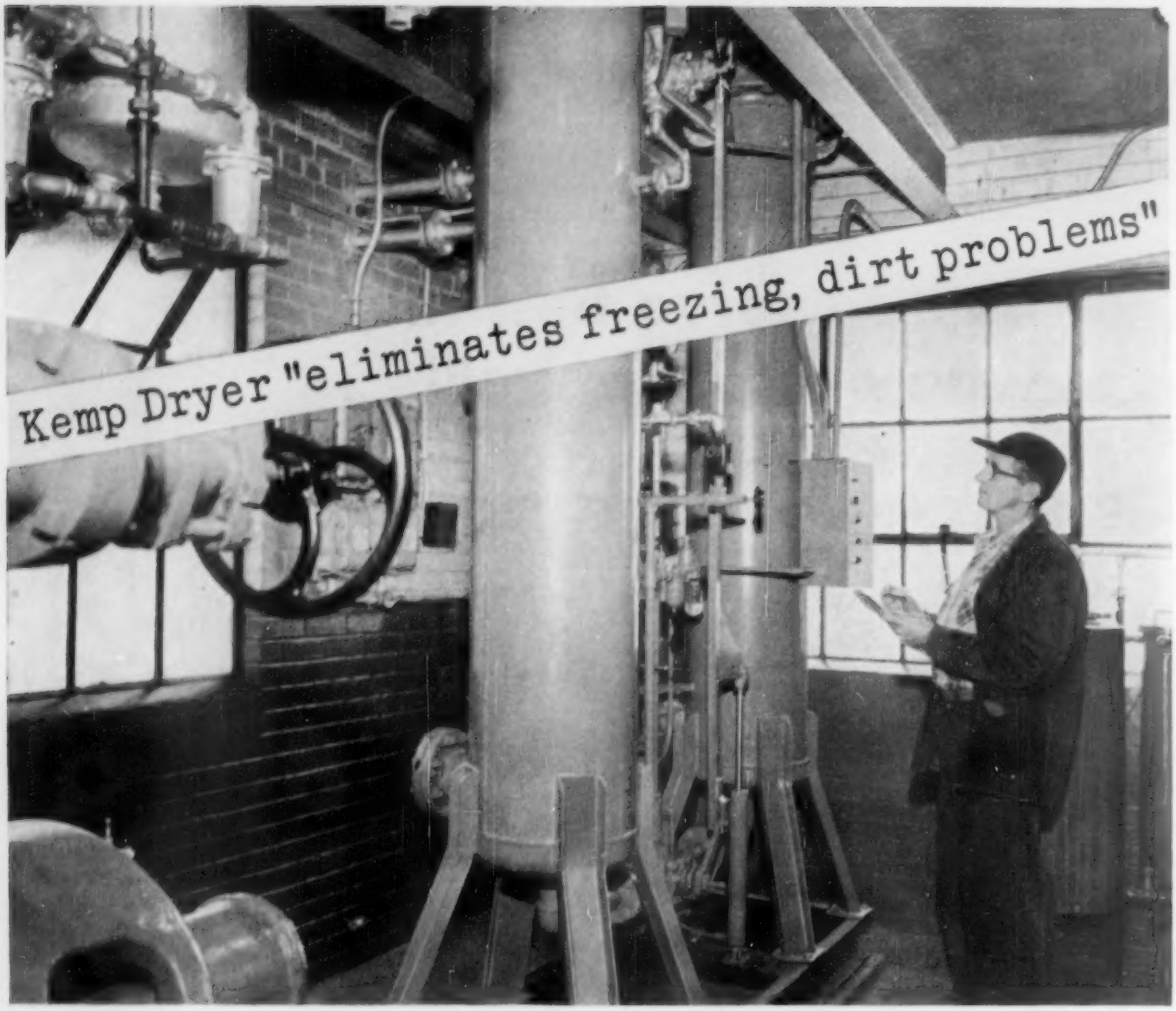
The Adjustable Crank CABOT* is floor clearing and equipped with a rubber tail bearing. This EQUALASTIC© bearing, patented and exclusive with CABOT, is a marked improvement in pumping-unit construction. It eliminates many parts and much maintenance. It does away with lubrication at this awkward point.

Any J&L man will welcome an opportunity to give you more interesting CABOT facts pertinent to production in your field, and detailed specifications.

*except AC-32

J&L STEEL

Jones & Laughlin STEEL CORPORATION
SUPPLY DIVISION—TULSA, OKLAHOMA
Serving The United States and Canada



Quaker State Reports: *Kemp Dryer protects instrument lines from freezing at temperatures of 25° below zero*

Instrument failure is now a rare thing at the Quaker State Refining Corp., Farmers Valley, Pa. Quaker State installed a Kemp 300-E Oriad Dryer in December, 1954, and according to Process Supervisor Joe Brown it has really done a job safeguarding instrument operation.

Kemp Saves Time, Labor

The company no longer has to steam trace or insulate instrument air lines. A longer period of time can be allowed between servicing instruments. Even at temperatures of 25° below zero, none of the lines froze. And to further save time and manpower, the dryer is fully automatic! Between its "elimination of instrument failure and ease of operation," Kemp earned its place on the Quaker State team.

Kemp Dryers for Every Purpose

Kemp offers a variety of dryer models to meet all problems. Designed to dry air, gases or liquids to sub-zero dew points at low cost, they are constructed of quality materials and embody the engineering knowledge gained from Kemp's many years of experience. They are available with manual, semi-automatic, or fully automatic tower reactivation. In addition, Kemp will prescribe the proper desiccant for each specific drying job. If you have a problem involving the removal of water from air, gases, or liquids, contact Kemp engineers now. For complete facts and technical information, write for Bulletin D-27.

KEMP
OF BALTIMORE

DYNAMIC DRYERS

CARBURETORS • BURNERS • FIRE CHECKS
METAL MELTING UNITS • INERT GAS GENERATORS
SINGEING EQUIPMENT

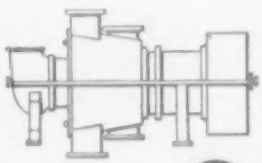
THE C. M. KEMP MFG. CO.
405 East Oliver Street, Baltimore 2, Maryland

FACTS on Westinghouse 5000-hp gas turbines . . .

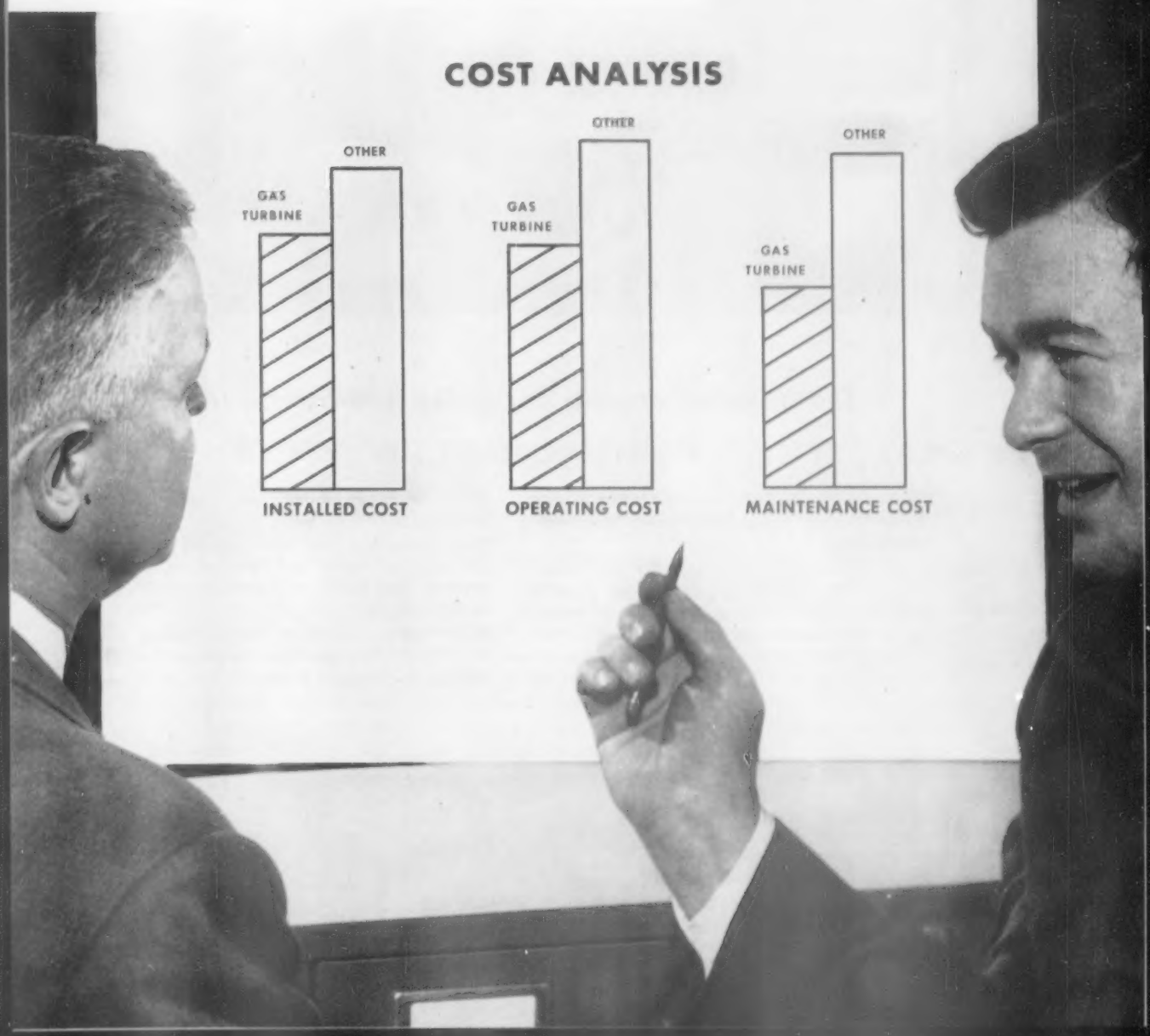
Lowest cost per booster horsepower

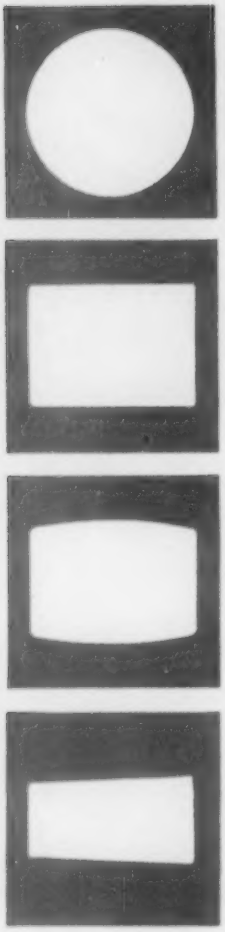
Here's why: Lowest first cost. • Takes fewer horsepower to do the job. • Lighter and smaller foundation required. • Much lower lube oil consumption. • No gas-cooling equipment required. • No water needed. • Lower maintenance. • Operation guaranteed to meet all specifications.

For more information, see your Westinghouse sales engineer, THE MAN WITH THE FACTS, or write for booklet B-5859. Westinghouse Electric Corporation, 3 Gateway Center, Pittsburgh 30, Pa. J-50579



YOU CAN BE SURE...IF IT'S Westinghouse





Ball Bearings

Cylindrical Roller Bearings

Spherical Roller Bearings

And now

Tyson **Tapered Roller Bearings***

The broadest product line in the anti-friction field.

SKF—and its field engineers—are now adding Tyson Tapered Roller Bearings to their recommendations.

Constantly working to broaden the SKF line—to make "the right bearing in the right place" a watchword throughout industry, SKF has recently introduced new lines of pillow blocks, styles and sizes of Max type ball bearings, the improved Type "C" Spherical roller bearing.

And *now* SKF offers Tyson Tapered Roller Bearings.

This means that from SKF you get the broadest range of types and sizes of anti-friction bearings *and* the most extensive anti-friction experience.

More today, than ever before, dealing with SKF Field Engineers assures you of the right bearing in the right place. 7648

*Manufactured by TYSON BEARING CORP., affiliated with SKF Industries, Inc. as a subsidiary.

SKF®

BALL AND ROLLER BEARINGS

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.,
manufacturers of SKF *and* HESS-BRIGHT® *bearings.*

This National Supply service . . .

KEEPS YOUR PUMPING COSTS DOWN!

Regardless of the location of your lease or producing area, you are never very far away from the National Supply service that economically keeps downwell pumps in top operating condition.

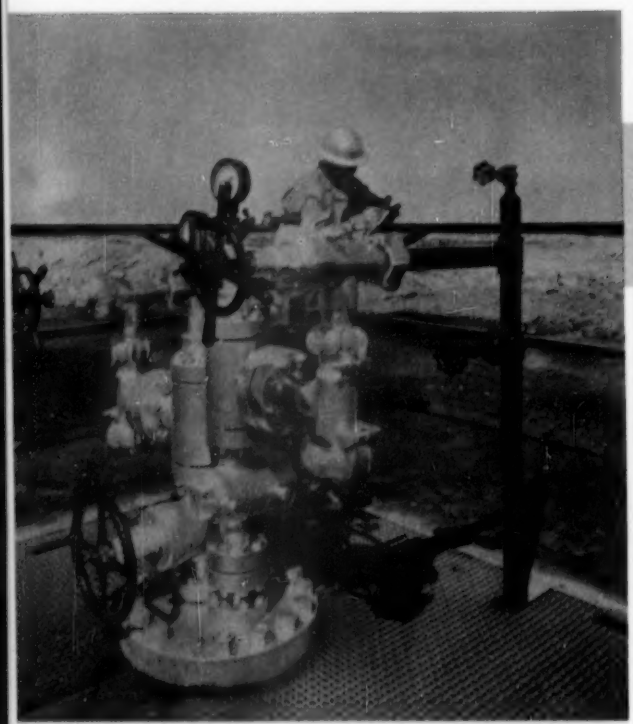
At these National service points, you'll find pump repair facilities that are equipped with modern equipment and trained personnel . . . personnel who know the "ins and outs" of virtually every type of downwell pump used today. What happens to your pump in a National Pump service center? We completely disassemble, clean and inspect the pump—install factory-fresh replacement parts wherever needed. In fact, no matter what the condition of a pump may be, National servicing returns it to you in good operating condition for those extra hours of service.

If you are not one of the thousands of customers who use this National service, why not stop by and see a National pump repairman in action? You may be surprised at the nominal cost of his careful, thorough services. For this service, like all of National's oil field supply and product activities, is tailored to fit your needs best.

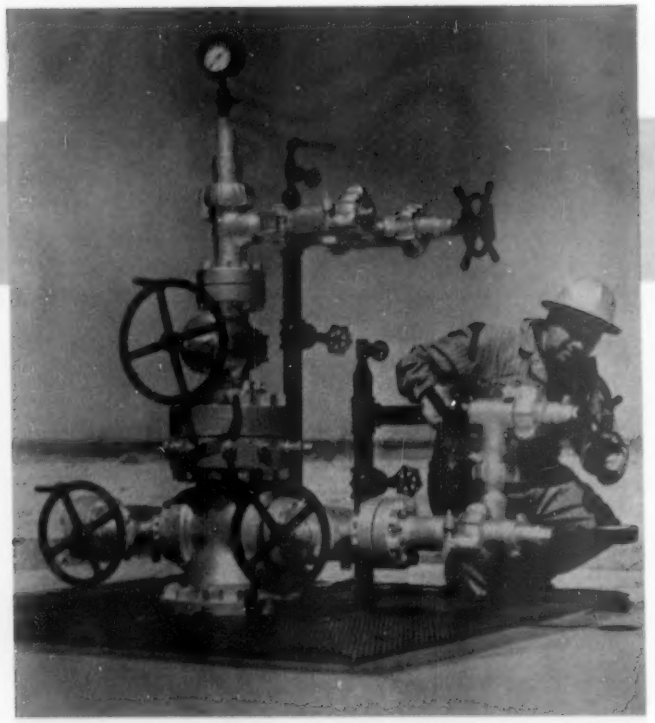
THE
NATIONAL SUPPLY
COMPANY

A step ahead in performance and safety . . .

NATIONAL WELLHEAD EQUIPMENT



New economy in completion costs is forecast by this National dual completion wellhead development. It enables users to operate two parallel strings of independently run 2" tubing. Individual master valves allow maintenance on one string, while production continues on the other string.



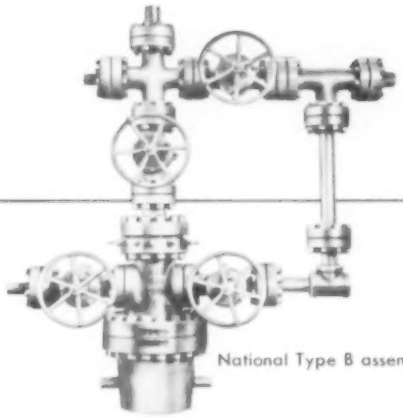
National's complete line of wellhead equipment provides a great variety of interchangeable combinations to meet any well requirements—in a complete range of test, working pressures and depth ratings meeting API standards.

Examine every component part of a National Wellhead assembly and you will see for yourself the extra safety margin that has been designed into these units to sustain a wide range of loads.

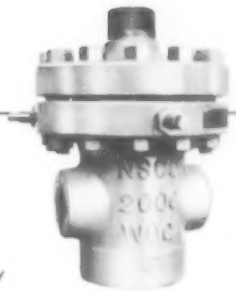
You can further be sure that these designs have been checked by elaborate tests throughout all steps of manufacturing—to provide you with wellhead assemblies of the highest quality in both performance and maintenance.

Important, too, is the ease of assembling National Wellhead equipment. Parts are self-locating and self-activating, so that special tools or adjustments are not needed. Maximum economies on any specific well can be affected through National's interchangeable components to suit varying casing programs with the same assembly—as well as crossover flanges and packing assemblies to handle one working pressure to another.

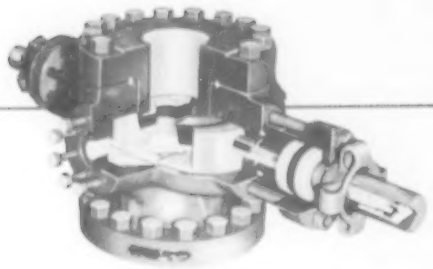
This high-quality, performance-proved equipment, plus the complete wellhead service available through the local National Supply Store or representative, can bring economical answers to your wellhead problems. You will find that, in addition to competent advisory service, National's complete line of wellhead equipment includes tubing hangers, bonnets, flanged and screwed fittings, flow beans and specialty items to meet every well requirement. Why not take advantage of this complete service soon?



National Type B assembly



National Type W Tubing Heads

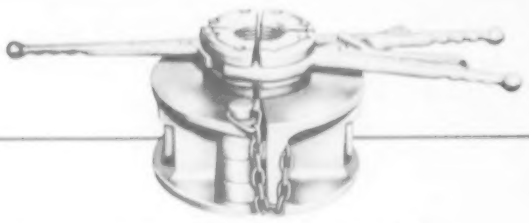


National Type C Ram Tubing Head

Every **National** wellhead component part is built to give you extra safety and maintenance economy!

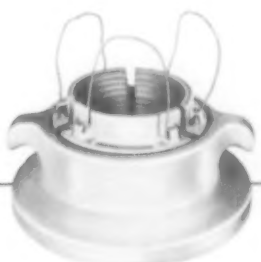
National Type D Casing Heads

National Type H Tubing Support

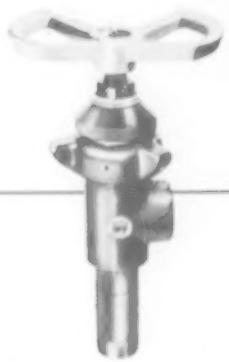


National Type B Tubing Spiders & Slips

National Type E Tubing Head with flanged body



National Type A Casing Support



National Adjustable Chokes

Call the local National Supply representative for his recommendations on the National Wellhead assembly that meets your well requirements best.

And, if you desire complete engineering information on National's complete line of wellhead components, Bulletins on each of these items are available at the local National Supply Store.

For other ways to cut production costs, see the next page

THE
NATIONAL SUPPLY
COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION OFFICES: Denver; Ft. Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N. Y., U. S. A.; City Wall House, Chiswell Street, London E. C. 1

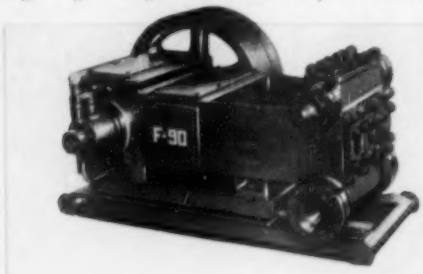
NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

NATIONAL *Sucker Rods*
are precision-manufactured in a range of grades engineered to suit virtually all well conditions and readily available at the National Supply Store nearest you.

NATIONAL *Pumping Units*
are manufactured in 22 standard combinations, API rated beam loads from 3,200 to 32,400 lbs.—there's a model to economically suit every pumping job.

NATIONAL *Triplex Pumps*
provide maximum volume and injection pressures for today's waterflood projects. Available in several hp ratings for both corrosive and non-corrosive service, these National Pumps are especially suited as power-oil source for sub-surface hydraulic pumping, oil gathering and salt water disposal services.

why settle for less than the best in pumping or waterflood equipment performance?



Specify NATIONAL
production equipment and be sure

NATIONAL'S *Ideal Plunger Lift®*
uses formation pressure for economically producing wells where reservoir conditions are suitable. For these certain types of wells, Ideal Plunger Lift® can be the best production method to use.

Be sure to have all of the facts on National Production Equipment for either primary or secondary recovery operations. Complete technical information and product bulletins are available from the National Supply representative or National Supply Store in your area.

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DIVISION OFFICES: Denver; Ft. Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
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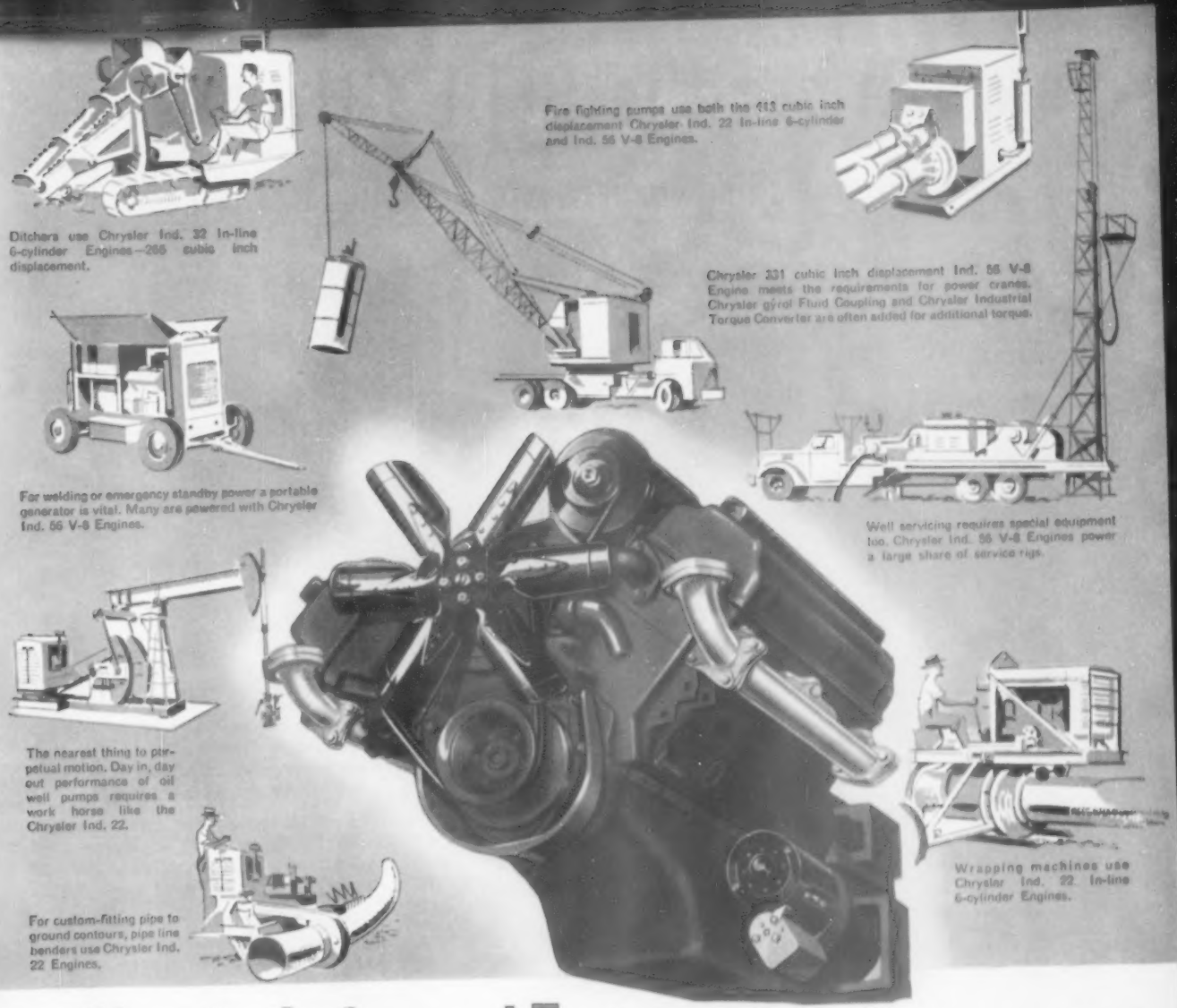
NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT


Ditchers use Chrysler Ind. 32 In-line 6-cylinder Engines—265 cubic inch displacement.
Fire fighting pumps use both the 413 cubic inch displacement Chrysler Ind. 22 In-line 6-cylinder and Ind. 56 V-8 Engines.
Chrysler 331 cubic inch displacement Ind. 56 V-8 Engine meets the requirements for power cranes. Chrysler gyrol Fluid Coupling and Chrysler Industrial Torque Converter are often added for additional torque.
For welding or emergency standby power a portable generator is vital. Many are powered with Chrysler Ind. 56 V-8 Engines.
Well servicing requires special equipment too. Chrysler Ind. 56 V-8 Engines power a large share of service rigs.
The nearest thing to perpetual motion. Day in, day out performance of oil well pumps requires a work horse like the Chrysler Ind. 22.
Wrapping machines use Chrysler Ind. 22 In-line 6-cylinder Engines.
For custom-fitting pipe to ground contours, pipe line benders use Chrysler Ind. 22 Engines.

It's Chrysler Industrial Engines for Petroleum Equipment too!

Check the equipment serving you in the oil fields. Note how many different types of equipment are powered by Chrysler. Trenchers, wrapping machines, fire fighting pumps, cranes, shovels, generators for standby power, pipe line benders, portable well servicing equipment, oil well pumps . . . you're likely to find any or all of these with Chrysler Industrial Engines powering them. There's good reason.

First, these manufacturers place a high premium upon dependability. They want assurance that the engines they install are honestly rated, that they will deliver as promised. They know from experience the Chrysler reputation for top-quality production, and they see in Chrysler Industrial Engines power their customers also know and respect.

Second, manufacturers know that Chrysler Industrial Engines are heavy-duty engines, designed, equipped and built to deliver high speed performance under any conceivable condition. Then, too, they know Chrysler Industrial Engines can be ordered factory-equipped to meet their own particular oil field requirements. For example, manufacturers may specify Chrysler Industrial Engines equipped with gasoline, butane or natural gas burning carburetors; velocity, belt or gear-driven governors; heavy-duty clutch and power takeoff; 3, 4 or 5-speed transmission; Chrysler gyrol Fluid Coupling or the New Chrysler Industrial Torque Converter.

Finally, equipment manufacturers want engines that offer their customers fast parts and service availability. Chrysler Industrial Engine Dealers are nationwide. No user is far from factory-authorized parts and service.

The next time you consider POWER FOR PETROLEUM, whether in producing, pipe line or processing equipment, check Chrysler—foremost supplier of dependable industrial power. To bring a Chrysler sales representative or literature on the Chrysler line, write: ***Dept. 157, Industrial Engine Division, Chrysler Corporation, Trenton, Michigan.***

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Baroid chemical additives are the blue chip products of the drilling mud industry. Drillers everywhere rely on these Baroid chemicals specifically designed for mud success.

To control viscosity, gel strength, and filtrate, and overcome the harmful effects of contaminants, use these specifically designed Baroid chemicals:

ANHYDROX *(barium carbonate)*
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SMENTOX *(specific for cement contamination)*
TANNEX *(quebracho compound)*

Baroid's service engineer can determine the specific chemicals best suited to treat your particular mud to save drilling time and reduce total mud costs. Specify Baroid chemicals.

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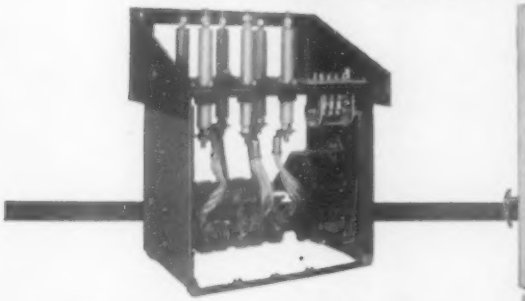
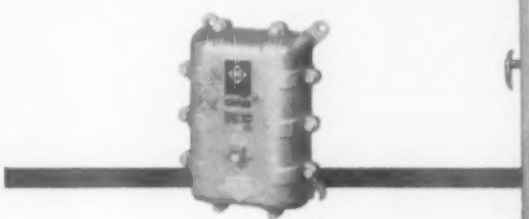
These Safety Features

meet operating demands of combustible atmospheres



Oil-immersed main contactor for safe operation

The complete contactor, including magnet and auxiliary switches, operates under oil to prevent sparks from igniting atmosphere and to protect mechanism from corrosion.



Relays and switching devices in explosion-proof cases

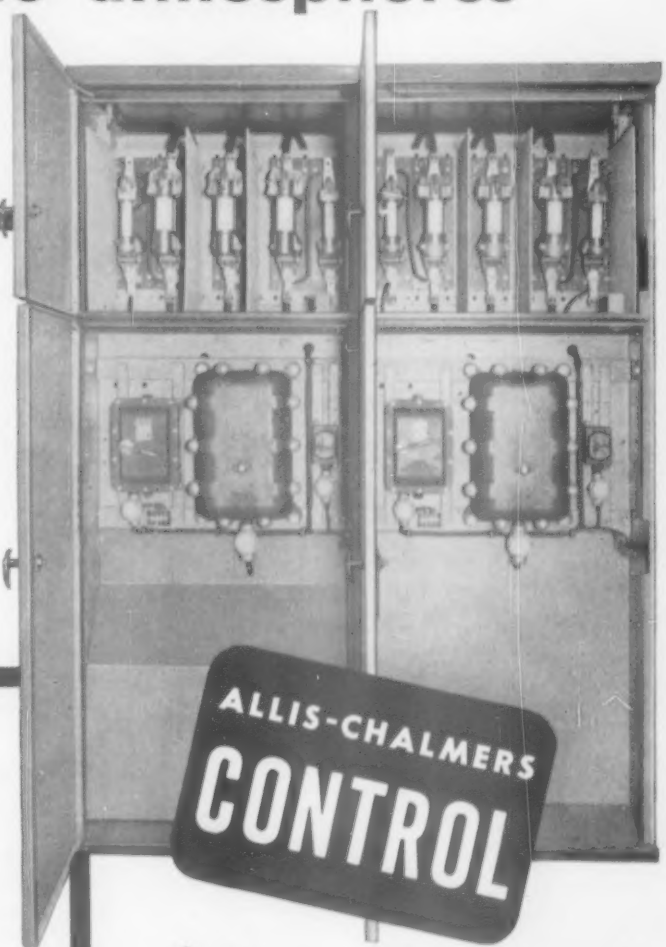
Further protection against the possibility of explosion is provided by NEMA VII enclosure which houses all overload, undervoltage, timing and auxiliary control relays as well as other low voltage switching devices.

Interlocked fuse compartment door

The fuse disconnect door is interlocked. The line contactor must be opened before access to the fuse is possible.

Other features *Steel barriers* in rear compartment prevent accidental contact with high voltage parts. Enclosure is finished with corrosive-resistant paint. Indoor or outdoor control equipment may be provided.

A-4583



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Type H starters for 2300 to 5000-volt motors

For complete information, see your Allis-Chalmers representative or write Allis-Chalmers, Milwaukee 1, Wis.

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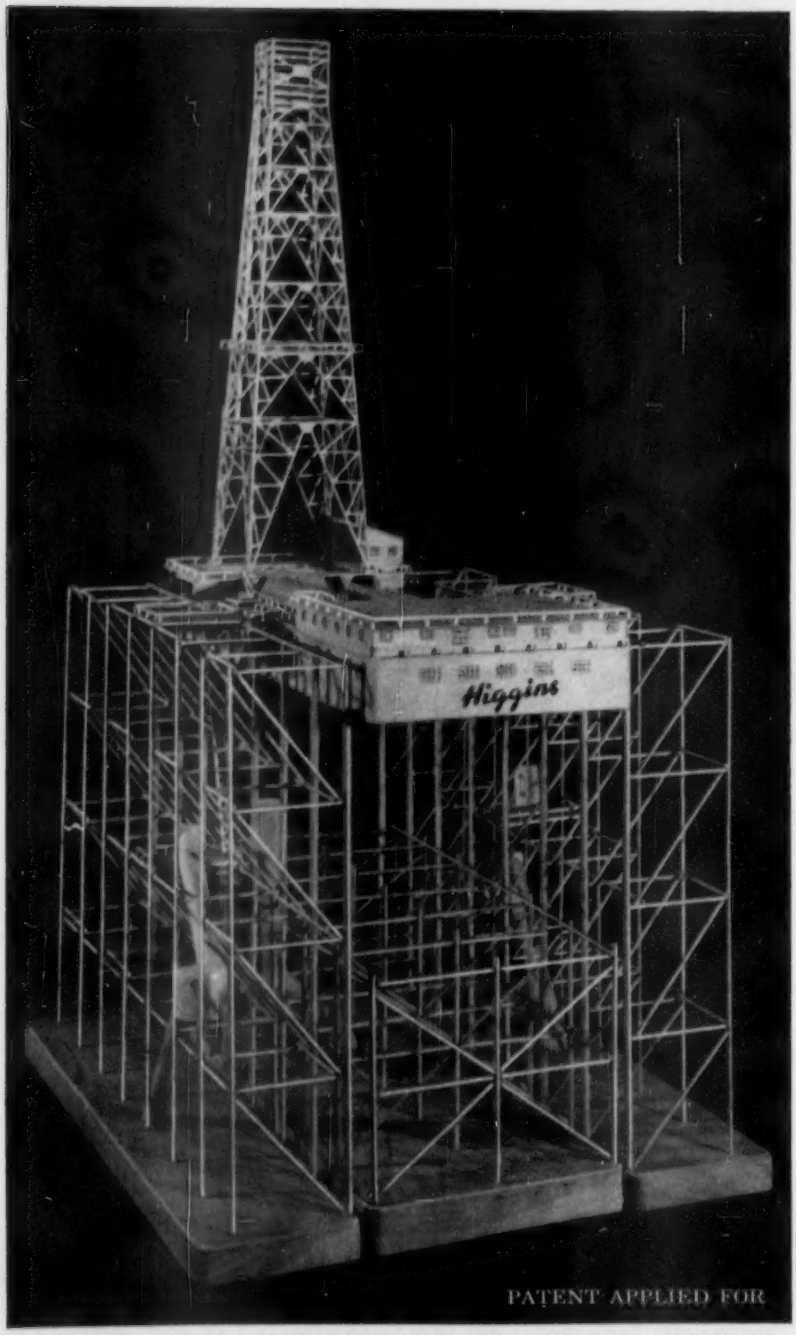
ALLIS-CHALMERS

Newest Submersible Unit Designed for Deep Water Drilling



As drilling operations go deeper and deeper the problem of stability in drilling structures increases. Now Higgins has designed a deep water submersible rig with eight advantages:

1 Simplified construction reduces initial and maintenance costs.

2 Ample clearance above mean gulf level permits operation under adverse conditions.

3 Utmost stability, even during lowering and raising operations, makes for greater operating safety.

4 Suitable spread footing offers sufficient resistance to movement from external forces.

5 Large bearing area permits variation of bottom pressure to offset soil limitations in certain areas.

6 Integrated units permit ease of transportation through locks, bridges and channels.

7 Supply handling simplified to save time and thus further reduce operating costs.

8 Makes possible the use of shallow-water drilling barges for deep-water operations.

Whatever your marine problem, large, small, simple or complicated, remember that Higgins is ready to deliver the job *right* on time!

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Southwest

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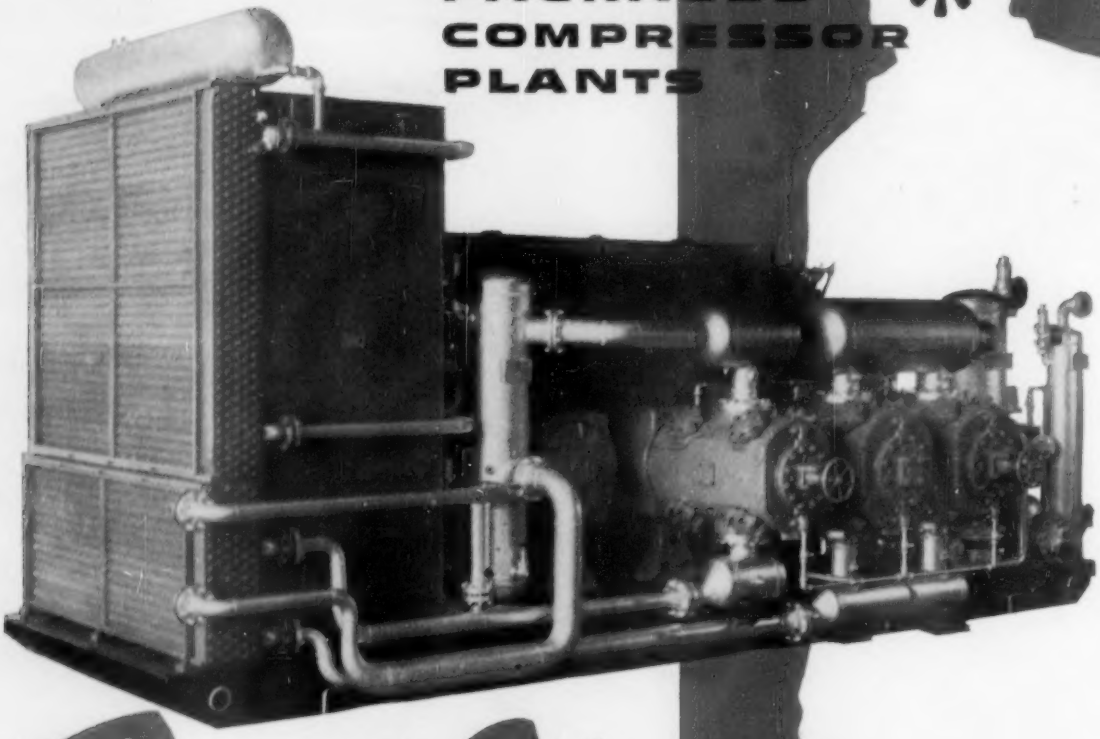

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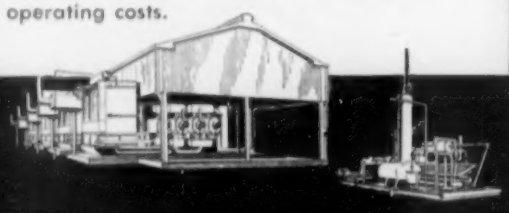

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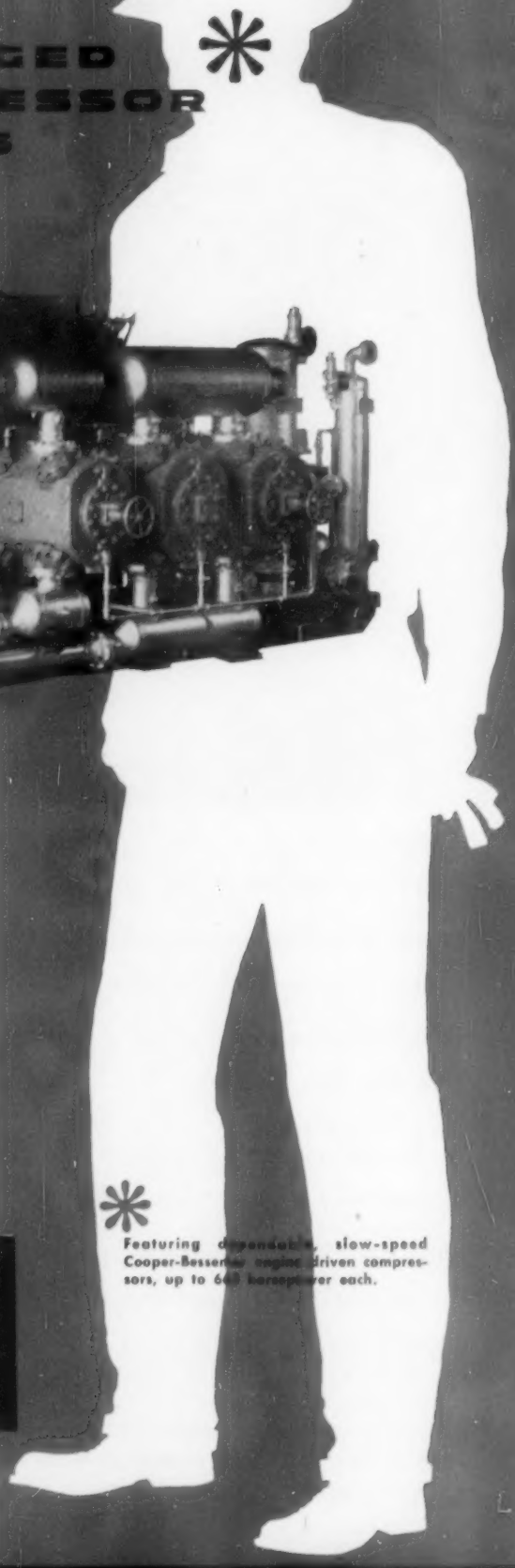

* Featuring dependable, slow-speed Cooper-Bessemer engine driven compressors, up to 660 horsepower each.

They Say—

Spacing Editorial Challenged

Dear Sir:

In your editorial of June 20, 1955, discussing well spacing in the Spraberry, Texas, areas, and the new town lot Jones sand pool in the old (1920) Huntington Beach, California, oil field, you state:

"The only way to determine the best well spacing is to hold up development drilling after the first few wells until the reservoir's size, yield, and payout are studied. Then start with quite wide spacing and turn to infill drilling later on if it is economical. The way to do this is to pool surface interests within a single drilling unit, whatever its size."

Little would be gained in California, in my opinion, by substituting drastic European type administrative regulation for the tried and proven American method of control by definitive statute.

The California law respecting well spacing (Chapter 3, Division 3, Public Resources Code, State of California), has been held to exclude the older fields. It provides for a spacing of one well per acre in new fields. This spacing is based upon the usual extraordinary high recoveries obtained per acre in California.

This statute could be amended to include new pools in old fields. Similarly the spacing could be widened out to, let us say, one well per 2½ acres. Nothing further would be required to prevent a recurrence elsewhere in California of the conditions in the new Jones sand pool in the old Huntington Beach oil field, to which you refer.

W. D. Inskeep
Petroleum engineer
Long Beach, Calif.

Editor's note: Do other California engineers and operators have suggestions?

Water-Flood Controls

Dear Sir:

With more and more available oil being shut in because of proration based on market demand, the state regulatory bodies indicate that they are considering reducing the allowables for oil wells producing in water-flood projects, and in some cases have done so.

In the past, these regulatory bodies have been sensible about the control of water-flood operations. They have been guided by the knowledge that water flooding is a salvage operation and

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weed
and grass
killer
prevents regrowth!
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Precaution against fire begins with weed elimination! Treat any area lightly with dry, ready-to-use UREABOR and you'll clear the ground of growth for a year, or more! It's that simple! No special equipment nor spray rig necessary. Save on labor and cut your maintenance costs the easy way—with UREABOR Weed Killer.
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19 holes from 1 location *

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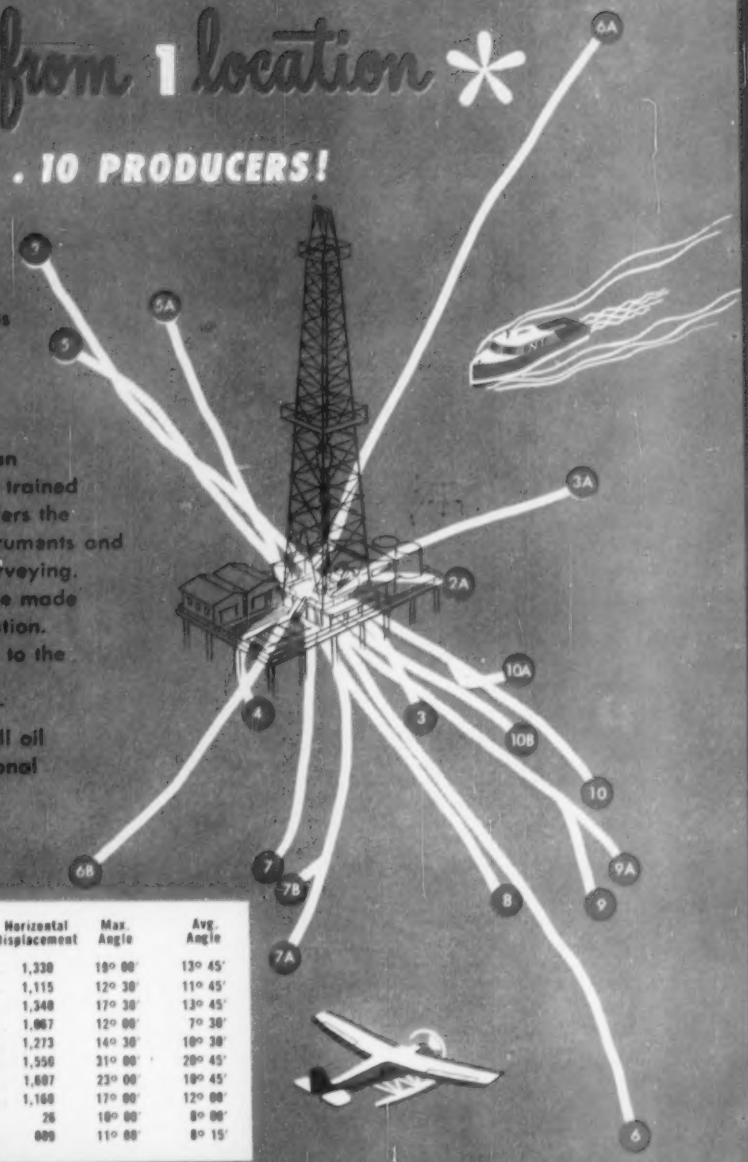
This was the first attempt at this type of exploratory drilling in the Gulf Coast and one square mile of area was explored.

Now that wells are being drilled to depths of 10,000 feet and more, and with present day state and federal spacing regulations, it is possible to explore two square miles or more of sub surface area.

HOMCO, with a background of more than twenty-five years of experience and the best trained engineers in the Directional Drilling field, offers the latest, and most complete line of tools, instruments and methods for Directional Drilling and Well Surveying.

Planned Directional Drilling proposals are made in advance of any Directional Drilling operation. All recommendations and suggestions made to the operator are based on HOMCO's many years of experience.

HOMCO maintains service locations in all oil producing areas having experienced Directional Drilling engineers ready to serve the industry twenty-four hours a day.



* LEGEND

Well No.	Horizontal Displacement	Max. Angle	Avg. Angle	Well No.	Horizontal Displacement	Max. Angle	Avg. Angle
1	vertical			6B	1,330	19° 00'	13° 45'
2	1,600	23° 00'	16° 30'	7	1,115	12° 30'	11° 45'
2A	400	9° 00'	6° 30'	7A	1,340	17° 30'	13° 45'
3	490	8° 30'	7° 00'	7B	1,067	12° 00'	7° 30'
3A	1,000	17° 30'	14° 00'	8	1,273	14° 30'	10° 30'
4	470	18° 00'	6° 45'	9	1,550	31° 00'	20° 45'
5	1,267	31° 45'	25° 00'	9A	1,607	23° 00'	19° 45'
5A	1,070	18° 00'	10° 15'	10	1,160	17° 00'	12° 00'
6	2,417	44° 00'	31° 00'	10A	26	10° 00'	8° 00'
6A	2,412	30° 00'	23° 45'	10B	609	11° 00'	8° 15'

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that the margin of profit is so small a restriction on the rate of production would discourage many projects.

A cooperating and concerted study should be made to determine the results of restricted rates of production on water-flooding operations.

In the absence of positive proof that the rate of production can be restricted without reducing the efficiency of water flooding, the regulatory bodies should be cautious lest their control cause waste instead of preventing waste.

J. W. Jordan
Executive vice president
Sinclair Oil & Gas Co.
Tulsa.

Reshuffling, the Decimal Point

Dear Sir:

In the June 6 issue of The Oil and Gas Journal, page 105, in the article on Italy's oil and gas entitled "Natural Gas Up Nearly 800 Per Cent in 10 Years," Table 5 presented some consumption figures of L.P.G. in Italy.

The notation under the title indicated millions of pounds per year, in which case the 1954 consumption was 490,006,000,000 lb. or 7,500,000 bbl. per day. It seems to me this should have read "thousands of pounds," in which case it would be 7,500 bbl. per day of L.P.G. consumption in Italy. . . .

The entire section regarding Italy was very interesting, and I certainly enjoy any articles you publish on foreign-petroleum operations.

John L. Coulter
Production Department
Gulf Oil Corp.
Pittsburgh

Editor's Note: Reader Coulter is correct. A misplaced decimal point caused the confusion.

Wilson Sees No Monopoly

"Robert E. Wilson, chairman of the board of the Standard Oil Co. of Indiana, . . . (declares) monopoly conditions do not exist in the industry. Of 452 industries in the nation, 382 have a greater concentration of control of output in the top four companies than natural-gas production does, he points out. Approximately the same ratio exists when the top eight companies are scanned in all businesses.

"'If natural-gas production is monopolistic, then practically every other industry in the nation is equally or more so,' he adds. 'Under such circumstances, there is no competitive system to protect.'

"Chairman Wilson says the natural-gas fight has degenerated into passionate demagoguery rather than thoughtful analysis, and we believe that is so. There are a good many angles to be considered, not the least of which is

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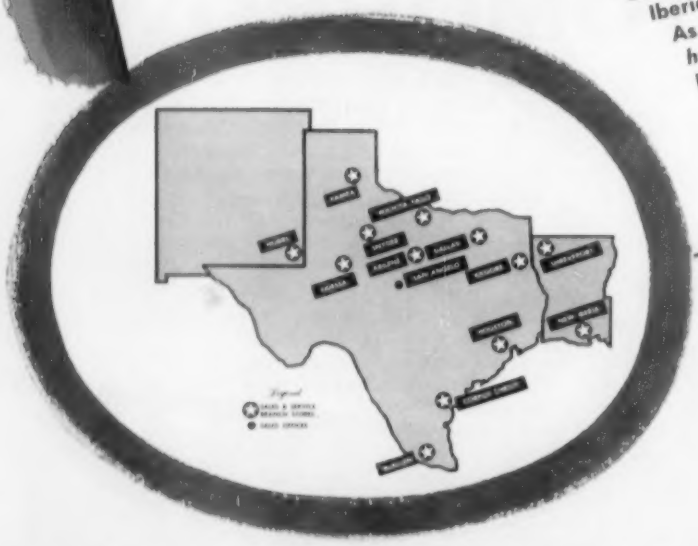

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the one brought forward by Mr. Wilson that in view of the closer approach to monopoly in many industries . . . it is only logical to believe their regulation must follow that of gas production."

Editorial in Tulsa Tribune.

CALENDER

JULY

20-22 Instituto Tecnologico y de Estudios Superiores de Monterrey, first annual short course on instrumentation for industry, campus, Monterrey, N. L., Mexico.

AUGUST

15-16 North Dakota Oil and Gas Association, annual meeting, Bismarck, N. D.

15-17 Society of Automotive Engineers, golden anniversary West Coast meeting. Hotel Multnomah, Portland, Ore.

29-31 15th annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

26-Sept. 15 Graduate summer session in reservoir engineering, University of Texas, Austin.

SEPTEMBER

2-3 Association of Desk and Derrick Clubs of North America, fourth annual convention, Commodore Hotel, New York City.

11-13 Independent Natural Gas Association of America, annual meeting, Jasper Park Lodge, Jasper Park, Jasper, Alberta, Canada.

12-14 American Institute of Electrical Engineers, electrical conference of the petroleum industry, Shamrock Hotel, Houston.

12-16 Tenth National Instrument Conference and Exhibit, Los Angeles, Calif.

12-16 Second International Instrument Congress and Exposition and tenth National Instrument Conference and Exhibit, Shrine Auditorium, Los Angeles.

14-16 National Petroleum Association, 53rd annual meeting, Traymore Hotel, Atlantic City, N. J.

14-17 American Association of Petroleum Geologists, western Canada regional meeting and fifth annual field conference of Alberta Society of Petroleum Geologists, Jasper, Alberta, Canada.

22-23 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

22-23 Louisiana-Arkansas Division, Mid-Continent Oil and Gas Association, annual membership meeting, Roosevelt Hotel, New Orleans.

25-28 American Society of Mechanical Engineers, Petroleum Mechanical Engineering Conference, Roosevelt Hotel, New Orleans.

26-28 American Association of Oilwell Drilling Contractors, fifteenth annual meeting, Rice Hotel, Houston.

26-28 American Institute of Chemical Engineers, fall national meeting, Lake Placid Club, Lake Placid, N. Y.

29 Natural Gasoline Association of America, Oklahoma regional meeting, Skirvin Hotel, Oklahoma City.

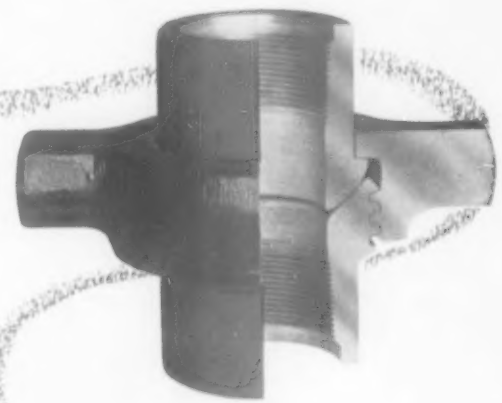
OCTOBER

2-5 American Institute of Mining and Metallurgical Engineers, Petroleum

Short Story

on

Long Service



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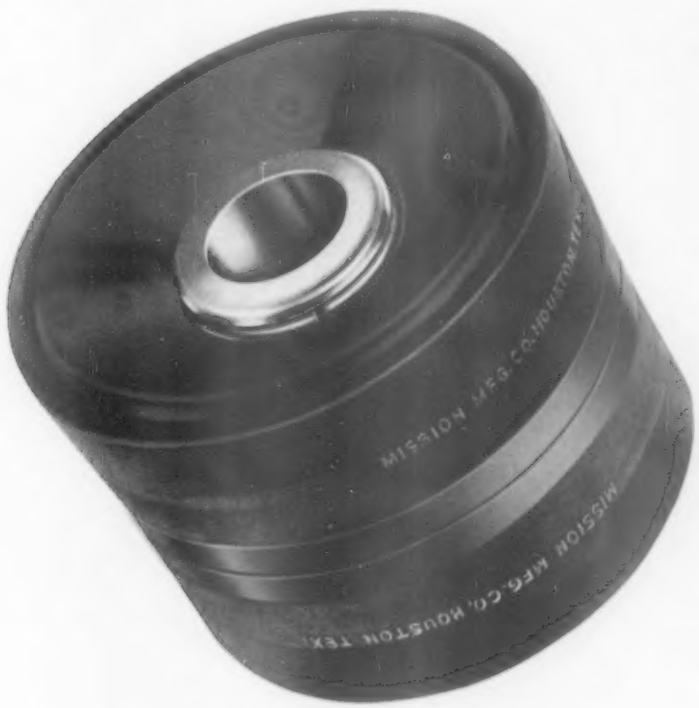

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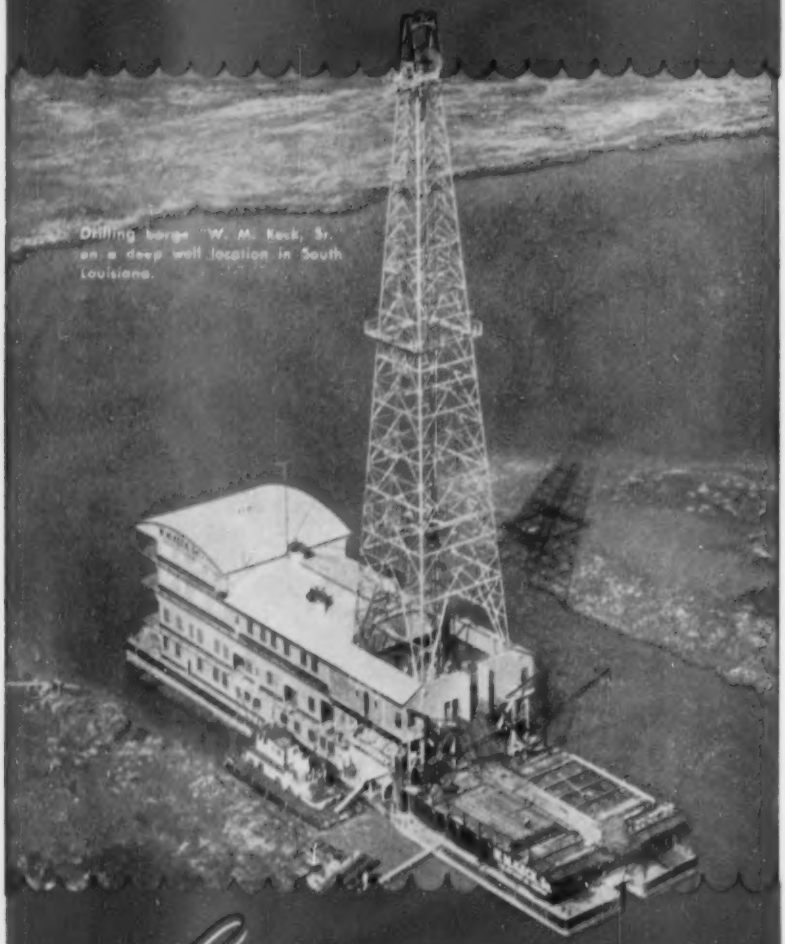

Drilling barge W. M. Keck, Sr. on a deep well location in South Louisiana.

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Branch, fall meeting, Roosevelt Hotel, New Orleans.

2-6 American Society for Testing Materials, Committee D-2, petroleum products and lubricants, Statler Hotel, Washington, D. C.

3-4 Texas Mid-Continent Oil and Gas Association, 36th annual meeting, Baker Hotel, Dallas.

3-6 Rocky Mountain Association of Petroleum Geologists and Denver Geophysical Society, 25th annual meeting, Denver.

9-15 American Petroleum Institute, Oil Progress Week.

12-14 National Association of Corrosion Engineers, sixth biennial Permian basin tour, Lincoln Hotel, Odessa, Tex.

12-14 Gulf Coast Association of Geological Societies, annual meeting, Buena Vista Hotel, Biloxi, Miss.

12-14 Gas Appliance Manufacturers Association, El Mirador, Palm Springs, Calif.

13-14 California Natural Gasoline Association, annual fall meeting, Ambassador Hotel, Los Angeles.

14 American Institute of Chemical Engineers, South Texas Section, 10th annual technical meeting, Galvez Hotel, Galveston, Tex.

17-19 American Gas Association and Pacific Coast Gas Association, annual meeting, Ambassador, Biltmore, and Statler Hotels, Los Angeles.

18-22 National Safety Council, 43rd National Safety Congress and Exposition, Chicago.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Garrett Hotel, El Dorado, Ark.

24-27 National Association of Railroad and Utilities Commissioners, natural gas panel discussion, Asheville, N. C.

27-29 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

28 Natural Gasoline Association of America, southern regional meeting, Captain Shreve Hotel, Shreveport.

31-Nov. 1 Independent Petroleum Association of America, annual meeting, Jefferson Hotel, St. Louis.

31-Nov. 2 National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago.

NOVEMBER

2-4 American Association of Petroleum Geologists, Mid-Continent regional meeting, Skirvin Tower, Oklahoma City.

2-4 Society of Automotive Engineers, diesel engine meeting, Chase Hotel, St. Louis.

9-10 Society of Automotive Engineers, fuels and lubricants meeting, Bellevue-Stratford Hotel, Philadelphia.

10-11 American Association of Petroleum Geologists, Pacific Section annual convention, Biltmore Hotel, Los Angeles.

13-18 American Society of Mechanical Engineers, 75th anniversary meeting, Hilton and Blackstone Hotels, Chicago.

14-17 American Petroleum Institute, 35th annual meeting, Mark Hopkins, Fairmont, St. Francis and Palace Hotels, San Francisco.

27-30 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Detroit.

DECEMBER

1-3 American Chemical Society, 11th southwest meeting, Shamrock Hotel, Houston.

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JOURNALLY SPEAKING...

Perils of Pipelining

OUR favorite oil publication prints scores of articles about pipeline corrosion, welding, rate of flow, and other problems involved in constructing the underground arteries of the oil and gas industry.

But hardly a thought is given to the right-of-way man, the poor son-of-a-gun who has to acquire the strip of real estate in which to bury the line. It seems to be assumed that since land exists practically everywhere, all that's necessary is to start digging.

It's not quite that simple, as testified by A. T. Bennett, an old-time r/w man of Pittsburgh, who has had troubles with birds, briers, and even murderers. Here are some of his experiences in his own words:

Several years ago when I was working on the Transco line, on the spread through Maryland, we had to deal with one of those unusual characters who are always encountered on any big line.

The property crossed was near the Gunpowder River and owned by a widow lady who was slightly off center on the subject of conservation. So much so that she was sitting on a stump waiting for the first cutters to come on her land.

Knowing about her and not looking for trouble, I cautioned the saw men and swampers to humor her in any foolish request until we were cut out through her property.

As the saw men started to cut one of the trees, she noticed a bird nest and running up said to one young fellow, "What are you going to do about that dear little bird nest?" He didn't know how to answer her, but not wanting trouble, climbed the tree, removed the nest, and put it in the crotch of a tree off right-of-way.

This pleased her and the cutting resumed. As the swampers started through, they ran into a long stretch of bull briers as high as your head. As it is almost impossible to cut through bushes like these without getting scratched up, the boys were sweating and cutting, their arms a mass of criss-crossed scratches. The lady again arose from her stump and approaching one sweating, scratched-up swamper, said to him, "Don't you hate to cut these beautiful bushes?"

For a minute he was speechless, but remembering that he had been cautioned about her, after swallowing a couple of times, said, "Yes, ma'am, I sure do." When she moved out of earshot, he said to his buddy, "Yeh, and I'll be dammed if I would be cutting them if I didn't have a wife and six hungry children."

While recently negotiating a right-of-way in western Pennsylvania, I was having quite a bit of difficulty getting the heirs of an estate to agree on a price. They were scattered from Florida to Virginia and were very evasive and noncommital. Not being able to pin them down, even with the help of their lawyer, I finally got a little tough and told off the heirs in western Pennsylvania, and after a good argument obtained the right-of-way.

At the conclusion of the deal, their lawyer told me that he was glad the deal was concluded as he feared that something might happen. Curious, I asked him what he thought might happen. He then told me that the father of these heirs had spent 16 years in the western Pennsylvania Penitentiary for killing a pipeliner years ago after a dispute about a pipeline, and that he was not at all sure whether the bad blood in the family might not assert itself again.

We're glad those western Pennsylvanians quit killing pipeliners by the time Mr. Bennett came along, thereby letting him survive to tell the tale and thus furnish us with material to fill this column which is better than what we could dream up.

We would be glad to hear more of Mr. Bennett's harrowing experiences with nature lovers and pipeline haters; or, for that matter, the adventures of other oil men which might be of interest to the 27 regular readers of this department.

—*Henry D. Ralph.*

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Here's what the Harris gas bill is up against

WHAT did we do wrong? The oil and gas industry is asking itself that question as a result of the 16-to-15 committee vote for the Harris bill and the stiff opposition in Congress to freeing gas producers from federal regulation.

The industry thought its case was just, simple, and convincing. It presented it in a dignified, factual, logical manner. Why, then, is the cry for federal control so strong and so persistent?

The answer may be seen in the four lengthy minority reports filed by various of the 15 dissenters on the House committee. Based on untruths, half-truths, and unwarranted assumptions, they contain many statements which will appeal to thousands who cannot—or will not—ascertain and weigh all the facts.

THE OIL INDUSTRY IS A MONOPOLY, it is flatly stated, and will control the price of gas in the absence of FPC regulation. The industry's aim, it is charged, is to raise the wellhead price to 25 cents per M.c.f., which will cost consumers $800,000,000 per year and write up the value of underground reserves by 30 billion dollars. It will then increase the price of furnace oil commensurately until both reach the limit of consumers' endurance.

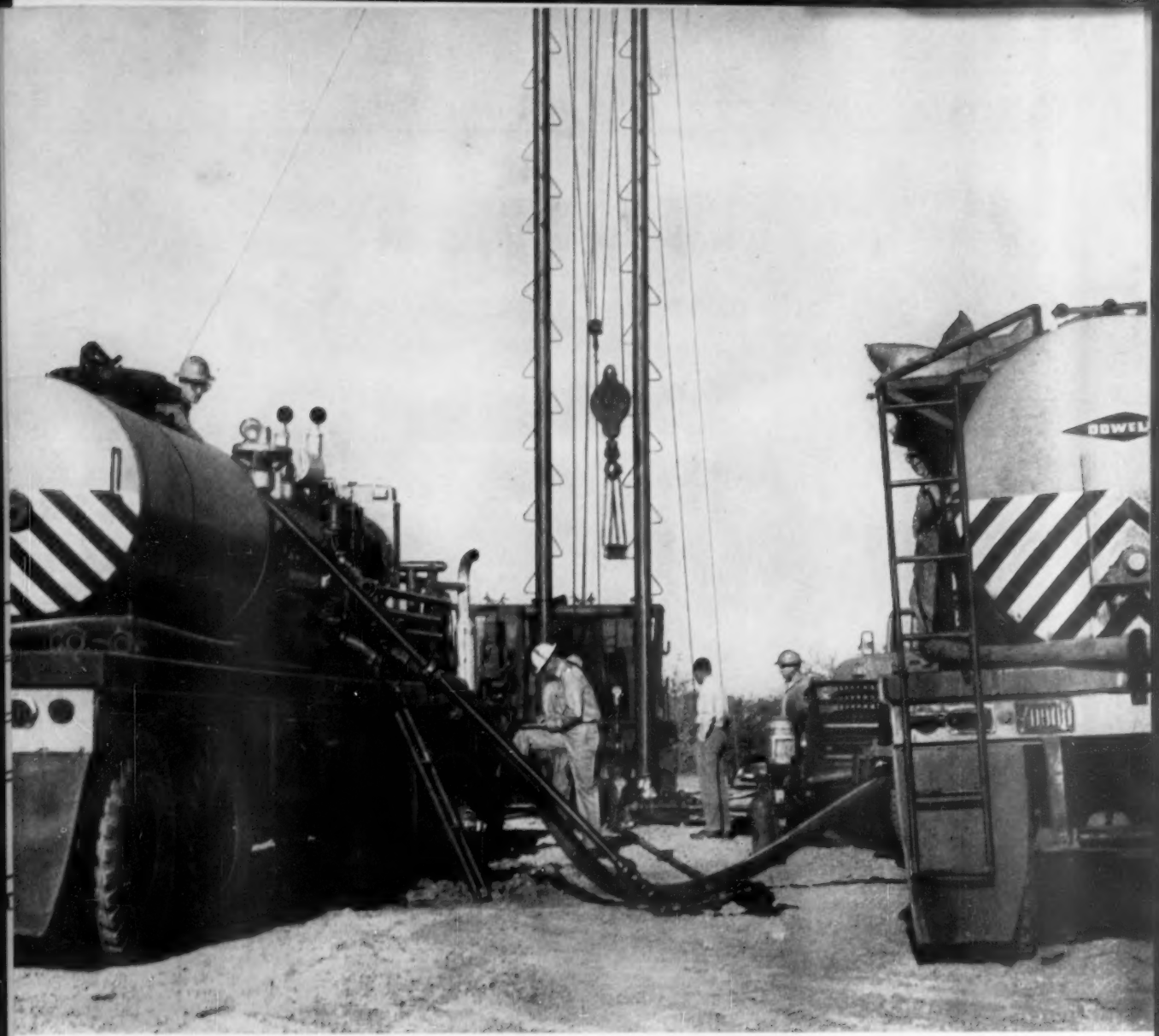
As if this were not enough to scare the timid, there are such phrases as "congressional approval to the oil industry to charge all that the traffic will bear . . . the hallmark of monopolistic price setting . . . confiscation of legitimate consumer investment on a scale never before envisioned . . ."

Again: "Rate structures for natural gas have become highly involved because it is to the advantage of the monopoly to make them so . . . the monopoly is trying to bring about conditions whereby they are protected and the consumer must pay and pay to satisfy the industry greed . . . prices are bound to continue their upward march if federal authority is removed . . . the potentialities are frightening to contemplate . . ."

The fear that low producer prices will cause a shortage is dismissed as groundless because ". . . at the price we are now paying there is tremendous incentive to look for gas . . . if we paid three times the price we now pay we would merely turn over 'windfall profits' to the oil and gas companies, and the increased effort put into search for gas would be negligible . . ."

THERE IS A LOT MORE in the same vein as these samples in the 49 printed pages of minority reports opposing the Harris bill. All great stuff for demagogs and headline hunters. Bare facts and cold reasoning have a hard time competing with such.

Obviously, whether the Harris bill passes or not, the industry must do a lot more missionary work to make itself understood by the public.



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Exclusive DOWELL fracturing treatment tripled flow, jumped potential to 2356 BOPD

With Petrofrac* an operator can use his own lease crude oil as the fracturing and sand-carrying medium. A special emulsifying agent is added to the crude to increase its sand-carrying ability. This permits large sand concentrations with little danger of screen-outs . . . even in large shot-holes. Kerosene, diesel fuel or distillate may also be used if crude oil is not available or suitable.

In one recent case, a well in a sandstone formation was making 10 BOPH. Dowell engineers fractured the well with 5,000 gallons of Petrofrac fluid carrying 10,000 pounds of sand. As a result, the well flowed 35 BOPH on a ½-inch choke. On a potential test it was rated at 2,356 BOPD.

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THIS WEEK . . . . . IN THE NEWS

Exploration

• A wildcat drilling 35 miles north of New Orleans may set a new deep-drilling record as well as new producing-depth record. Richardson & Bass 1 LL&E-Humble-"L" has hit 19,752 ft. and may go to 22,500 ft. which would make it the world's deepest hole. Gas-condensate shows have been logged at two depths greater than the world's producing depth of 17,500-17,895 ft.

• Activity is expected to pick up in the northeastern region of the Anadarko basin following Sun's wildcat gas discovery in Oklahoma's Harper County. The well flowed 7 million cubic feet of gas daily on a test of the Morrow-Penn sand at 7,000-30 ft. Harper County activity has been at a virtual standstill since 1952.

• Alberta's fabulous Pembina field, thwarted on its northern flanks by Imperial's six dry holes, now appears headed for a westerly trend. Texaco Exploration last week announced five apparent wildcat producers in its $13,000,125 concession. Oil men now will closely watch Standard of California's projected drilling program on a 92,160-acre lease just west of Texaco's holdings. California Standard paid $10½ million for the tract last month.

International

• Saudi Arabia is finding the market for its crude being pinched. Production this year is off 11,700 bbl. daily from the output in the first 5 months of last year. Aramco officials say renewed oil production in Iran is the cause.

• Jordan may be the newest Middle East nation to get an oil play. Edwin C. Pauley, California oil operator, reportedly has been granted a 30-year exploratory concession on a 50-50 profit-sharing basis. German, Swedish, and Belgian interests are bidding for similar deals.

• A significant switch is being noted in the export economy of Soviet Russia and Romania. Oil last year replaced grain as the top export commodity in both countries. American officials consider the exports an arbitrary diversion from domestic use to obtain foreign exchange income.

Imports

• Canadian oil is looming ever larger in the United States crude picture. Imports already total 30,000 bbl. daily. That figure is expected to double within a few months. And Canada is just beginning to flex its big production muscles. This growing output will be looking for expanded markets, which means: We can expect more Canadian oil to flow through U. S. refineries.

• Total imports to the U. S. will increase 15 per cent during the third quarter over the same period last year, according to company estimates given the Texas Railroad Commission. The prospect is for imports of over 760,000 bbl. daily.

Offshore

• Leasing part of Louisiana's tidelands by both the state and federal Government July 12 has developed a new problem. The state threatens to prosecute firms drilling within 10.5 miles of the coast without the state's approval.

• Offshore production has been extended to two new areas. Sinclair has discovered a new field on State Lease 2490 in Block 15 off Lafourche Parish. Kerr-McGee and Union have come up with the second discovery in State Lease 1268 in Block 47 in the Main Pass area.

Pipelines

• With Alberta's election out of the way, action is expected soon on the dormant Trans-Canada pipeline plan. Biggest barrier has been financing. Observers expect a compromise involving a shorter line and a gas swap with Tennessee Gas Transmission.

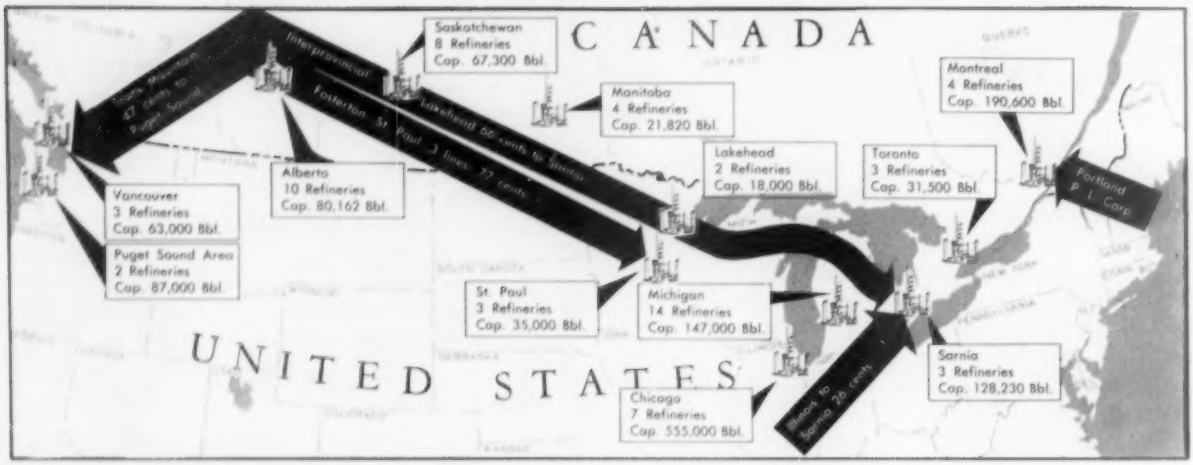
• Right-of-way work is completed and ditching is under way on Texas Eastern's 30-in. line which will replace the gas capacity of the Little Big Inch line. The Little Big Inch will be returned to products service. Pipe laying will begin as soon as pipe becomes available to contractors.

Government

• The decision on whether to bring the Harris bill to a vote this session of Congress or next is in the hands of House leaders. Closely divided sentiment leaves the outcome in doubt even after a poll of individual congressmen. Supporters believe gas producers would have a better chance for exemption from control next year after an investigation of distribution costs.

• Oil companies will lose control of service-station lessees if Congress passes a bill sponsored by Representative Roosevelt of California. Station operators could sell competitive products without fear of losing their leases.

• Fuels research by the Bureau of Mines will proceed on schedule this year. Congress granted the exact appropriation requested.



Long-range government, private policy is involved in . . .

Canada's Rising Oil Flow to the U.S.

CANADA is beginning to assume a larger role in the United States crude-oil supply picture. Oil from Canada's great discoveries in the western provinces is flowing across the U. S. border in a steadily rising stream.

It is estimated conservatively that imports from Canada will double within a few months. And this is only a start. Canadian oil already is competing with supplies from Illinois, the Mid-Continent, and Rocky Mountain areas. As a nation heading for a big production surplus, Canada must compete increasingly in markets largely determined by conditions in the United States and the rest of the world. Canadian output this spring reached 234,000 bbl. daily. If present firm forecasts are borne out, the figure will soar to 3,500,000 bbl. daily by 1980. That is more than half the present U. S. production.

Much of Canada's oil is produced by United States companies with no refining or marketing facilities in Canada. But where will this tremendous output find a market? All signs point in the same direction: There will be more and more Canadian oil in America's future.

C. O. Willson

WESTERN Canada's steadily increasing oil production is rapidly becoming a significant factor in the petroleum supplies of the United States.

Canadian crude imports into the United States have already reached 30,000 bbl. daily, according to latest official figures for April. Imports to the lakehead refineries in Wisconsin and Minnesota averaged 4,000 bbl. daily. They were 26,000 bbl. daily to the Puget Sound area of Washington.

And the total is considered certain to double at least over the next few months.

Pipeline connections have been completed for two new U. S. refineries which will operate with Canadian crude oil. They are the 50,000-bbl. refinery of Shell Oil Co. at Anacortes, Wash., and Great Northern Refining Co.'s 25,000-bbl. refinery at Pine Bend (near St. Paul), Minn.

They are scheduled to be on stream by late summer and early fall.

It is understood that crude shipments to still another Minnesota refinery will start this fall.

The extension of Canadian crude-oil outlets into the United States was foreseen 7 years ago when potentialities of Leduc and Redwater fields in Alberta were first realized. Now the flow of Canadian oil across the border is rising steadily.

And the end is not in sight. The early fields have been followed by a number of discoveries, some of major importance, in the western provinces. Current production of Canada is 234,000 bbl. daily. Available production is at least 100,000 bbl. daily greater than that figure.

There is general agreement that this figure of availability will jump to at least 1,000,000 bbl. daily within the next 5 years. This projection appears justified on the basis of present discoveries.

Reserves to soar . . . Furthermore, few have challenged predictions that proved reserves in western Canada, now approaching 3 billion barrels, will increase to 20 to 25 billion barrels not later than 1980.

This reflects the confidence of explorationists and operators that the successes since the Leduc discovery of 1947 will lead to additional finds over the next 25 years which will make western Canada one of the world's major oil areas.

Evidence points to a yearly increase in available production of around 150,000 bbl. daily until at the end of the 25 years the reserves would justify a daily production of 3½ million barrels.

Most Canadian operators are willing to let this long-range outlook take care of itself. But they are concerned with what appear to be assured trends over the next 5 years.

Canada's domestic demands are expected to total 650,000 bbl. daily by 1960. Should the present division of markets prevail at that time, 250,000 bbl. daily of the 650,000 bbl. would be supplied by crude imports to refineries in Quebec and the Maritime provinces.

This would leave 400,000 bbl. daily to be supplied by the western provinces, exclusive of the small settled production in Ontario. It is assumed that the Canadian outlets in northwest United States will expand so that refineries in that area will require at least 125,000 bbl. daily by 1960. There should also be some expansion in the Minnesota and Wisconsin outlets.

But despite this growth, that means that at the end of 5 years western Canada will have at least 400,000 bbl. daily of crude oil over and above normal

domestic demand and for the existing pipeline connections to refineries in the United States.

The accompanying map and tables were prepared to show the basic price and transportation conditions in United States and Canada which are keys to any solutions that may be adopted.

Briefly, they reveal that in future expansion, Canadian outlets must more and more compete in markets largely determined by developments in the United States and, in a broad sense, world conditions.

Illinois equation . . . When Alberta crude oil was made available at Sarnia —first by a combination of pipeline and Great Lakes shipments and later all pipeline—delivered prices had to compete with crude oil which had been available from Illinois and the Mid-Continent fields for over 50 years. From this competitive situation has come what is now termed the "Illinois equation."

The application of this equation in current operations, including long-term contracts, is shown in the accompanying table. In effect this means that crude-oil prices of the Alberta fields connected to the Interprovincial and Lakehead system must be competitive with delivered price for Illinois crude at Sarnia.

This explains why the Alberta crude schedules were reduced earlier this year and in late 1954 when posted prices for Illinois crude oil were lowered.

Distance a problem . . . The distance from Edmonton to Sarnia along the Interprovincial and Lakehead systems is 1,772 miles, which is longer than any crude-oil movement by pipeline in the United States. Present deliveries require only a part of the 300,000 bbl. daily capacity of the system.

The high tariff, a reflection of the distance from markets and part capacity operations, explains why prices for the Alberta crudes are around 20 cents per barrel under United States schedules for comparable crudes.

While Illinois crude oil is used as the key price for the Canadian market, crude from the Mid-Continent and Rocky Mountain area is a direct competitive factor in the eastern movement of western Canadian crude oil.

Crude from Oklahoma, Kansas, Colorado, Wyoming, and Texas (exclusive of the Gulf Coast and Southwest Texas), as well as other Middle West crudes, is delivered to Middle West refineries by pipeline and inland waterways. Eastern Montana crudes, through a pipeline connection to Wyoming trunklines, will also shortly be available to Middle West refineries.

Indicative of this competition a recent survey showed that sweet crude from Wyoming was being shipped to Michigan refineries at a delivered cost of $3.46. Denver - Julesburg, Colo., crude was available to the same points at $3.39 and Oklahoma crude at $3.35. To deliver Redwater crude to these points would require pipeline extensions. To the delivered Sarnia price the U. S. import duty of 10½ cents plus the exchange discount would be added. The same competitive situation prevails in deliveries to Chicago area refineries.

U. S.-Canada competition . . . Market students point out that the competition of these several producing areas is a direct factor in Illinois crude prices. That posting in turn determines the delivered price of Illinois crude oil at Sarnia. This is important because it means that wherever Canadian crude oil is delivered to the Middle West markets, it will have the direct competition of one or more producing areas in this country.

With this situation in mind it has been suggested that the outlets for western Canadian crude be extended to the east to include practically all of the Canadian domestic requirements. It is known that some government officials of Canada profess to favor such a program.

The expansion of Canadian crude output so that it now supplies over 50 per cent of the total domestic market, instead of 10 per cent previous to 1948, has greatly aided the dominion's foreign exchange.

It is contended that a complete independence of imported crude-oil supplies would further strengthen the exchange situation and would greatly benefit the entire Canadian economy, whose growth has been outstanding since the close of World War II.

Price cut indicated . . . This would mean a new pipeline or extension of the Interprovincial-Lakehead system to Montreal refineries with a minimum distance of 2,300 miles from Edmonton. The distance to the refinery at Halifax would be 3,000 miles. These extensions could only be accomplished through a further lowering of western Canada's crude-oil prices to offset the increased transportation costs.

One analysis points out that serving the Montreal refineries with western Canada crude would involve a minimum pipeline transportation cost of 75 cents per barrel. The same plants are now being supplied with South American crudes with a transportation charge of around 37 cents per barrel. This involves, in the case of Montreal, a tanker shipment plus a pipeline charge from Portland, Maine.

The difference would have to be absorbed by Canadian producers should an all-domestic policy be adopted. Opponents of the all-Canadian proposal present these arguments to show that the penalty to the Canadian oil industry would far outweigh any advantages that might accrue to other phases of the nation's economy. The conclusion of most observers is that domestic-im-

COST FACTORS IN OIL DELIVERY FROM CANADA

. . . To Sarnia

Illinois Crude

	Per bbl.
Posted price (36° gravity)	$2.90
Gathering charge	.10
Pipeline allowance	.0303
Pipeline tariff	.2608
Delivered cost at Sarnia (U. S. funds)	3.2911
Discount on U. S. funds (1⅝%)	.0535

Redwater, Alta., Crude

Field price	$2.49
Gathering allowance and charge	.0525
Pipeline allowance	.0257
Pipeline tariff	.66
Marketing charge	.01
Delivered cost at Sarnia (Canadian funds)	3.2382
Discount on U. S. funds (1⅝%)	.0526

. . . To Minnesota, Wisconsin

Fosterton (Sask.) Crude to Pine Bend (St. Paul)

	Per bbl.
Field price (23° gravity)	$1.29
Gathering charge	.10
Pipeline tariff	.77
Tender deduction	.043
Delivered cost (Canadian funds)	2.173
Discount on U. S. funds (1⅝%)	.0351
U. S. import duty (under 24° gravity)	.0525
Total	$2.2606

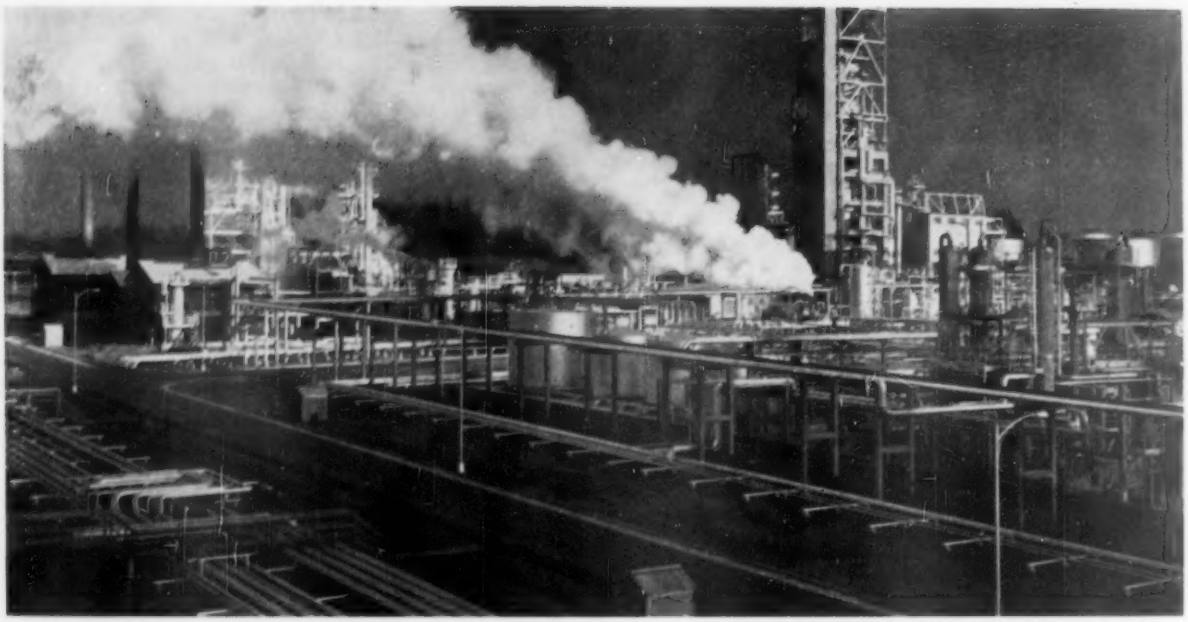
Redwater (Alta.) Crude to Superior and St. Paul

Field price	$2.49
Gathering allowance and charge	.0525
Pipeline allowance	.0257
Pipeline tariff	.46
Total (Canadian funds)	$3.0282
Discount on U. S. funds	$0.0493
U. S. import duty	.1050
Total (U. S. funds)	$3.1825

. . . To Puget Sound

Redwater Crude to Washington

	Per bbl.
Field price	$2.49
Gathering allowance and charge	.0525
Pipeline allowance	.0257
Pipeline tariff	.47
Marketing charge	.01
Total (Canadian funds)	$3.0482
Import duty	$0.105
Discount on U. S. funds (1⅝%)	.0495
Delivered cost	$3.2027



GENERAL PETROLEUM CORP.'S 35,000-bbl. daily refinery near Ferndale, Wash., 12 miles south of the Canadian border, is another U. S. plant taking Canadian crude oil. It is Washington's first major refinery.

port markets should be fixed at approximately their present divisions.

Special problem solved . . . The building of a new refinery near St. Paul and the new pipeline facilities connecting to that point are the solution to a special problem that existed in the south Saskatchewan area where a substantial production of low-gravity, high-sulfur crude oil had been developed.

The high pipeline tariff (see table) includes a penalty charge of the Interprovincial for the movement of the high-viscosity crude. It also reflects the fact that the new pipelines in Saskatchewan and Minnesota in the beginning will operate at only part of their rated capacities.

The rate of 46 cents per barrel for Redwater crude to Superior, Wis., was also recently made effective to St. Paul. It is understood that another refinery near St. Paul will be taking deliveries of Canadian crude later this year.

This development indicates that the delivered cost for Redwater crude is competitive with present pipeline and water shipments (via Mississippi River) to St. Paul from the Mid-Continent and Rocky Mountain fields.

Furthermore, the Minnesota pipeline connecting to the Interprovincial is 16-in. and could deliver twice as much crude oil to St. Paul as can now be handled by the two refineries in that area. This has been interpreted to point to additional refining capacity in this area or an extension of the line to other points.

Puget Sound area . . . The breakdown of the deliveries to the Puget Sound area of Washington is similar to that of the lakehead refineries in Wisconsin, although the pipeline mileage is substantially less.

The pipeline of the Trans Mountain Pipe Line Co. from Edmonton to the point in eastern British Columbia where the system branches off to Vancouver refineries and to the Puget Sound refineries is 24-in. It is anticipated that the line will eventually double or triple present shipments.

Higher deliveries are expected to justify reductions in the present pipeline tariffs of 46 cents to Vancouver and 47 cents to the Puget Sound plants. These refining operations will therefore become more attractive, assuming there are no changes in the posted field prices for crude oil.

The present delivered prices for Redwater crude to Puget Sound and Vancouver refineries are competitive with crude oils from the Persian Gulf area of the Middle East, and from Venezuela and Peru. Redwater crude has an important advantage over available light-gravity crude from California.

Future markets . . . Among the producing organizations which are finding large reserves in the western provinces are companies which have no refinery and marketing outlets in Canada. But they are major refiners and distributors in this country.

The question is: Will some of these operators find it expedient to build refineries and establish wholesale and retail facilities in Canada to secure outlets for their new crude supplies?

Analyses made of this type of expansion for producing interests indicate that the Canadian outlets would be limited and probably prove costly. The population of Canada is less than one-tenth that of the United States and the consumption per capita in the dominion is less than two-thirds this country's.

New York State has a larger population than all Canada and its petroleum consumption is far greater. There are half a dozen states with individual oil demands closely approximating Canada's.

High transportation charges are involved in the movement of western Canada's crude supplies to eastern consuming centers. It is also true that some of the western operators, through affiliated interests, are helping to supply a part of the eastern Canada market with imports. With these conditions prevailing it is believed that growth in western Canada's crude-oil output will not result in important new entries into Canadian refining and marketing.

U. S. market indicated . . . This leads to the conclusion that U. S. companies which develop important reserves in Canada will prefer to dispose of their production through new refineries or existing plants in the United States.

The territory extending 100 to 300 miles south of the U. S.-Canada boundary and as far east as Ohio is under consideration as an outlet for excess

Canadian production. But no general conclusions are possible yet.

There would be direct competition from U. S. crude. In addition, the picture is complicated by the steady expansion of product pipelines, use of inland waterways in this country, and the presence of local crude supplies and refineries in the northern states.

Some studies have indicated that the most economic expansion will be in the large markets of the Chicago and Detroit areas and important inland consuming centers in Michigan, Minnesota, and Wisconsin.

U.S.-Canadian policy . . . The solution to the market problem is inevitably tied up with future U. S.-Canadian governmental policies. And some contend the Canadian producers should receive special consideration in the matter of oil-import duties to this country. This argument has many angles.

First there is national defense. Canadian imports would not be terminated in the case of another world war and could quickly be integrated as an essential part of a common defense program.

This also ties in with studies being made of the future oil requirements of this country. These reveal that domestic demands, exclusive of a national emergency can be fulfilled only by addition of more than 90 billion barrels of new reserves in this country over the next 20 years.

This is more domestic oil than has been discovered since the Drake well 95 years ago. It assumes continuation of the present ratio between domestic production and imports from other countries, exclusive of Canada.

U. S. needs Canada . . . Some observers say that it will not be possible to find reserves of that magnitude, without including the expected major discoveries in Canada. They feel that demands and supplies should be considered on a continental basis. Preference would be given to Canadian oil imports in this country over those coming from distant points in other continents.

Other U. S.-Canadian conditions are cited in support of this type of program. The economies of the two countries overlap in many respects. This country is largely dependent on Canada for important raw materials. Canada is also the largest customer of the United States.

There are officials at Ottawa and Washington who feel that this interdependence should be fostered and expanded in the interests of both countries. They advocate whatever oil-policy changes may appear necessary to promote this relationship.

ROCKY MOUNTAIN

Colorado Tax Challenged

DENVER.—Validity of Colorado's 2-year-old gross income tax on oil and natural-gas production has been challenged in District Court here by The California Co.

The firm has long voiced opinions against the law, and earlier in the year Gov. Ed C. Johnson warned the oil companies to leave the law alone or face a more severe tax *(The Oil and Gas Journal, February 8, page 78).*

The California Co. says the tax is unconstitutional and illegal. The firm contends the severance tax denies due process and equal protection under the law and that it is limited to the oil and gas industry instead of applying to all natural resources.

The levy brings the state about $5,000,000 yearly. The company asked a refund of $947,430.

Natural-Gas Line Started

LARAMIE, Wyo.—Work is in full swing on the 140-mile Laramie-Denver section of Colorado Interstate Gas Co.'s 380-mile, 22-in. natural-gas line between Rock Springs, Wyo., and Denver.

The first of 217 railroad carloads of pipe began arriving here last week. Each carload will provide enough pipe for 700 ft. of the line. Other materials are due to arrive shortly.

Crews of Houston Contracting Co., Houston, Tex., have been in the field for some time conducting ditching operations. A spread of about 150 men is expected to complete the line in 4½ months.

Estimated cost of the initial construction is $8 million. In addition to the pipeline itself, three meter stations will be built near Cheyenne, Wyo., Greeley, and Denver, Colo.

Construction this season will swing the line southeast from the Laramie area to a point 11 miles south of Cheyenne and then directly south into Denver. Eventually the line will be extended to Rock Springs to connect with Pacific Northwest Pipeline Corp.'s line from the San Juan basin to the Canadian border in Washington State.

Protesting Farmers Bypassed

DURANGO, Colo.—Pacific Northwest Pipeline Corp.'s San Juan basin to Canada pipeline has been shifted slightly to bypass 40 protesting Colorado farmers.

A group of Montezuma County landowners held out for more than the $1 a rod offering for rights-of-way. So Fish Northwest Constructors, Inc., selected an alternate route that veered the pipeline into adjoining Dolores County. Property owners there quickly signed agreements in order to obtain benefits from the pipeline's large tax valuation.

Two remaining holdouts among 100 additional Montezuma County landowners have been named defendants in District Court condemnation proceedings. The court issued a go-ahead order to the contractor and named a board to determine a fair price for damages to the condemned land.

The dispute delayed for a few days start of work on the Ignacio, Colo., to Moab, Utah, section of the 1,466-mile, $163 million line.

Shale Plant Gets Reprieve

RIFLE, Colo.—The U. S. Bureau of Mines' $14 million oil-shale plant here will continue operating through July at least.

The plant actually was closed 12 hours June 30 before John H. East, Jr., regional bureau director at Denver, was notified of the eleventh-hour congressional action temporarily averting the shutdown. The bureau anticipates passage of a $1,250,000 supplemental appropriation for further operation of the plant until additional research is completed.

Many of the plant's 200 employes already had left their jobs for posts in private industry before East ordered all dismissal notices cancelled.

New Rangely Rules Due

DENVER.—New regulations to prevent waste of oil and gas in the huge Rangely field will be studied July 14 at an emergency meeting of the Colorado Oil and Gas Conservation Commission.

The meeting follows a state Supreme Court ruling that the commission exceeded its authority in ordering reinjection of gas into the Weber formation of the northwestern Colorado field, the state's largest.

Operators in the field have been invited to submit recommendations for new regulations. The commission will issue new rules later.

Processing Plant Started

WORLAND, Wyo.—Signal Oil & Gas Co. is constructing a desulfurization plant in Little Buffalo field, a new Washakie County gas field, 10 miles south of here.

Sweetened gas will be piped to Montana-Dakota Utilities Co., which plans to expand natural-gas service in the Worland area.

Line Contracted

Little Inch replacement let to four contractors

SHREVEPORT.—Texas Eastern Transmission Co. last week identified the contractors who are handling construction of its 377-mile, 30-in. natural gas line from Beaumont to Kosciusko, Miss. The line will replace the Little Big Inch in gas service.

Contracts were let several weeks ago, but the announcement was withheld until Federal Power Commission approval of the 30-in. line was granted. This was received last week. The commission earlier had approved construction of the line with 24-in. pipe.

Some contractors already have completed right-of-way work and part of the ditching and are now waiting on pipe.

The change in pipe size was granted only a week after the FPC agreed unanimously to permit the company to change the Little Big Inch from gas to products service *(The Oil and Gas Journal, July 4, page 62)*.

The contractors and their sections are:

. . . **Houston Contracting Co.,** Houston, 59 miles from near Beaumont to 12 miles east of DeQuincy, La.

. . . **Tulsa Williams Co.** (Williams Brothers), Tulsa, 118 miles from 12 miles east of DeQuincy to 5 miles east of New Roads, La., near the Mississippi River.

. . . **H. C. Price Co.,** Bartlesville, Okla., 134 miles from New Roads to near Clinton, Miss.

. . . **H. B. Zachry Co.,** San Antonio, 64 miles from Clinton to Kosciusko.

River crossings were awarded to Pentzein, Inc., Omaha; Missouri Valley Dredging Co., Omaha; and J. Ray McDermott Co., Harvey, La.

Two Texas Firms May Merge

HOUSTON. — Stockholders of two Houston independent oil companies will vote August 24 on a proposal to merge into a new firm to be known as Texas National Petroleum Co.

The new company would be formed by Johnston Oil & Gas Co. and Texam Oil & Gas Co. The two have combined assets estimated at approximately $40 million.

Ralph A. Johnston, president of Johnston Oil & Gas, and W. Stewart Boyle, president of Texam, said directors of the two companies have approved the merger plan. The proposal calls for each stockholder to receive the same number of shares in the new company as he now holds.

Johnston Oil & Gas has an interest in extensive leases in New Mexico and Colorado. Texas has production in several areas of Texas in addition to nonproductive leases in Texas, Louisiana, New Mexico, Colorado, Wyoming, Nevada and Utah.

Things Are Sometimes Crowded in Sherman, Tex.

It isn't an optical illusion. The doghouses do jut out over the porch. Crew members on Fleet Drilling Co.'s Rig No. 7 have to enter the doghouse from the rig floor. The ladder normally used is in place, but it doesn't lead anywhere. Townsite drilling is becoming routine in Sherman, which sits over a tremendous anticline. Operators believe a large part of the townsite may eventually be productive. At present 67 rigs are active in Grayson County, developing sands between 7,500 and 11,000 ft.

Industry Briefs

HOUSTON. — Jefferson Chemical Co. moved its headquarters from New York to Houston last week. The move involved the transfer of about 50 employes. Jefferson Chemical, jointly owned by American Cyanamid Co. and The Texas Co., has its main plant at Port Neches, Tex., and operates a research laboratory at Austin.

WASHINGTON.—Central Kentucky Natural Gas Co. of Charleston, W. Va., a Columbia Gas System subsidiary, will acquire the gas pipeline facilities of the Frankfort Kentucky Natural Gas Co., one of its wholesale customers. Central Kentucky received Federal Power Commission approval to take over 41.7 miles of pipelines extending from its terminal near Lexington, Ky., to Frankfort.

NEW YORK. — The International Gas Union's sixth conference is scheduled for September 25-30 here at the Hotel New Yorker. Robert W. Hendee, president of the union, said all members of the gas-utility and pipeline industry as well as gas appliance manufacturers are invited. Delegates are expected from all 17-member nations.

ODESSA, Tex.—The National Association of Corrosion Engineers will sponsor the sixth biennial Permian basin corrosion tour October 12-14. Some 250 are expected to attend, inspecting 300 pieces of equipment in 60 exhibits under actual oil-field operation.

WASHINGTON. — The Bureau of Land Management will open bids July 20 for oil and gas leases on 34.39 acres in the Waskom field and 235.35 acres in the Mooringsport field, both in Caddo Parish, Louisiana. Bids will be opened July 27 for leases on 42.17 acres in the Cartersville field and 48.52 acres in the Elm Grove field, both in Bossier Parish, Louisiana.

LAFAYETTE, La.—More than 175 exhibitors have reserved space for the first Louisiana Gulf Coast Oil Exposition to be held here October 13 through 16. Plans call for making the show a biennial event, according to R. D. Cloninger, president.

Imports Continue Spiral

Reports to Texas Railroad Commission indicate 15 per cent gain in third quarter; average to hit 760,000 bbl. daily

AUSTIN.—Crude imports will show a 15 per cent increase during the third quarter of this year compared with the same period in 1954, according to company estimates given the Texas Railroad Commission.

Imports will average slightly more than 760,000 bbl. daily in the quarter if receipts follow plans reported to the commission. The same companies reported third-quarter imports last year at 663,100 bbl. daily.

Percentage increases over the corresponding quarters of last year have been gradually declining. But the smaller percentage gains have been influenced by the very rapid gains in imports last year. Crude imports gained 7.3 per cent between the first and third quarters last year. Third quarter imports this year are scheduled to go only 4.4 per cent above the average for the first quarter.

For the first 5 months of this year, importing companies reported crude imports averaging 715,000 bbl. daily. Forecasts for the next 5 months average 758,000 bbl. daily.

Importing companies reported smaller crude receipts in May than in May of last year, but the decrease was due to peak imports for May 1954 rather than to actual decreases this year. A new record was set by crude imports in May of last year, and the average of 723,500 bbl. daily, reported to the Texas Railroad Commission, was higher than totals compiled by the Bureau of Mines or the Census Bureau.

Company reports indicate a new crude-import record for June which in turn will be topped by imports during August. Despite a 12,000-bbl. daily reduction for September, the schedules for the third quarter call for an average of 762,300 bbl. daily. October imports will be down 22,600 bbl. daily from the third-quarter average but up 12.7 per cent from October 1954.

The seasonal decline in product imports from the first to the second quarter of this year was less than last year. As a result, second-quarter product imports represented a gain of 16.9 per cent over last year compared with a increase of 15.8 per cent in the first quarter.

This larger gain may have been due to irregular scheduling since the increase for the third quarter is expected to drop to 6.9 per cent, followed by a gain of 18.8 per cent in October.

Breakdown of Import Reports to Commission

(Thousands of barrels daily)

	Actual*		Estimated or forecast*				
	May 1954	May 1955	June 1955	July 1955	Aug. 1955	Sept. 1955	Oct. 1955
CRUDE—EAST COAST:							
Atlantic Refining Co.	71.5	77.1	60.8	60.8	60.8	60.8	60.8
Cities Service Co.	13.3	33.1	30.5	31.3	28.3	31.4	28.3
Eastern States Petroleum Co.	4.9	14.9	31.8	28.0	27.0	27.0	27.0
Gulf Oil Corp.	145.0	116.0	115.0	114.0	117.0	115.0	115.0
McBride Oil & Gas Corp.			3.3	3.2	3.2	3.3	3.3
Phillips Petroleum Co.	6.6	3.8	10.0	9.7	9.7	10.0	9.7
Sinclair Oil Corp.	61.6	60.4	66.0	66.0	66.0	66.0	66.0
Socony Mobil Oil Co.	90.0	74.6	75.0	67.0	64.0	64.0	64.0
Southwestern Oil & Refg. Co.		7.2	7.3	7.1	3.6	7.3	(¶)
Standard Oil Co. of California	85.5	66.2	75.0	75.0	75.0	75.0	75.0
Standard Oil Co. (Ind.)	20.3	10.1	20.4	16.3	16.4	16.9	16.3
Standard Oil Co. (N.J.)†	81.0	93.0	79.0	79.0	79.0	79.0	79.0
Sun Oil Co.	14.5	15.2	30.3	31.6	28.7	28.7	28.1
The Texas Co.	66.2	61.1	71.4	70.0	68.9	68.0	43.2
Tide Water Associated Oil Co.		11.9	11.0	15.4	15.6	16.4	12.0
Total East Coast	660.4	644.6	686.8	674.4	663.2	668.8	633.7
CRUDE—WEST COAST:							
Shell Oil Co.					15.8	23.3	22.6
Socony Mobil Oil Co.		27.4	27.0	27.0	27.0	27.0	27.0
Standard Oil Co. of California	31.2	15.4	16.7	16.7	16.7	16.7	16.7
Tide Water Associated Oil Co.	21.2	26.7	27.2	29.2	34.9	9.8	28.9
The Texas Co.	10.7	7.6	4.0	14.4	10.9	11.0	10.8
Total West Coast	63.1	77.1	74.9	87.3	105.3	87.8	106.0
Total crude	723.5	721.7	761.7	761.7	768.5	756.6	739.7
PRODUCTS:							
Asiatic Petroleum Co.	9.6	6.4	11.0	7.5	4.5	8.0	7.0
Cities Service Co.		1.6					
Eastern States Petroleum Co.	16.0	19.7	17.3	17.3	17.3	17.3	17.3
Gulf Oil Corp.	2.0	4.0	6.0	7.0	4.0	6.0	6.0
Shell Caribbean Petroleum Co.‡	77.0	80.0	80.0	70.0	74.0	92.0	125.0
Shell Oil Co.	16.2	17.0	17.7	20.2	21.4	17.3	17.5
Socony Mobil Oil Co.	3.4	3.4	7.4	10.8	10.8	10.8	10.8
Standard Oil Co. (Ind.)§	20.0	34.0	2.2	17.1	16.1	18.3	19.4
Standard Oil Co. (N.J.)†	128.0	161.0	158.0	101.0	101.0	101.0	187.0
The Texas Co.							
Total products	272.2	327.1	299.6	250.9	249.1	270.7	390.0
Total crude and products	995.7	1,048.8	1,061.3	1,012.6	1,017.6	1,027.3	1,129.7
Bonded fuel included‖	62.5	63.8	77.1	79.2	76.2	79.8	75.7

*From company reports to the Texas Railroad Commission. †Based on quarterly estimates. ‡Imported by independent distributors. §Received through suppliers who can furnish either domestic or foreign oil. ¶Unreported by company. Average of 6,000 bbl. daily included in total. ‖Mostly duty free for bunkering ships in foreign trade.

CRUDE IMPORTS*

(Thousands of barrels daily)

	1954	1955	Per cent change
January	600.8	716.8	19.3
February	609.1	747.3	22.7
March	642.3	721.4	12.3
First quarter	617.7	729.9	17.8
April	571.8	669.4	17.1
May	723.5	721.7	—0.2
June	617.5	761.7	23.4
Second quarter	638.5	717.6	12.4
July	678.8	761.7	12.2
August	654.2	768.5	17.5
September	656.0	756.6	15.3
Third quarter	663.1	762.3	15.0
October	656.1	739.7	12.7

PRODUCT IMPORTS*

(Thousands of barrels daily)

	1954	1955	Per cent change
January	450.5	508.1	12.8
February	482.6	519.0	7.5
March	346.9	451.8	30.2
First quarter	424.8	492.0	15.8
April	301.0	356.9	18.6
May	272.2	327.1	20.2
June	268.8	299.6	11.5
Second quarter	280.6	327.9	16.9
July	254.9	250.9	—1.6
August	218.1	249.1	14.2
September	247.8	270.7	9.2
Third quarter	240.2	256.8	6.9
October	328.2	390.0	18.8

*From company reports to the Texas Railroad Commission. Data for June-October are company forecasts.

100-TON PILOT PLANT where American Gilsonite proved its unusual processing plan.

Contracts due soon on plant to make . . .

. . . Gasoline From Utah's Gilsonite

Ted Armstrong

AMERICAN GILSONITE CO. is about ready to let contracts on one of the world's most unusual processing plants.

The plant, which will convert gilsonite into high-quality coke and high-octane gasoline, will be one of the world's first privately financed commercial projects to make conventional petroleum products from a material other than crude oil.

There will be several unusual features in American Gilsonite's project.

. . . The gilsonite will be obtained by a new hydraulic mining technique.

. . . It will be pumped as a slurry through a 100-mile pipeline from the mine to the processing plant.

. . . The new plant, using a conventional delayed coker, a fractionator, and a catalytic reformer, will convert the solid, brittle material into coke, gasoline, and a high-B.t.u. gas which will be used as plant fuel.

Site of the plant has not yet been announced, nor has the type of catalytic reformer to be used. Last week officials of American Gilsonite were completing work on specifications for process facilities.

The company expects to spend $10,000,000 to expand its mining operations, lay the pipeline, and build the processing plant, which will handle between 600 and 700 tons of gilsonite daily.

Contract for the coker is expected to be let in July, with contracts for other processing units and the pipeline to follow in a few weeks. Construction is scheduled to begin this autumn, with the plant going on stream in 1956.

The plant is expected to be built within about a 100-mile radius of Bonanza, Utah, where the company will obtain its feed material.

What is gilsonite? . . . The raw material is a black, solid hydrocarbon with a high resin content.

It has been mined near Bonanza since 1904 and is now used largely in making floor tile, storage batteries, inks, and insulation. It is named after A. H. Gilson, owner of a deposit where it was first observed. It is an asphaltite and is believed to have been formed by polymerization of oil originating in Tertiary shales which underlie the deposits.

Gilsonite occurs in nearly vertical fissures that vary in depth from 100 ft. to more than 1,500 ft. The fissures vary in width up to 22 ft.

The mining technique . . . The dangers of dust explosions forced American Gilsonite to develop a new method of producing the unique feed stock for its plant.

The company plans to sink a vertical shaft between the rock walls which enclose the gilsonite fissure. Drifts will be cut into the gilsonite in both directions from the shaft. The first drifts will be driven at a depth of about 100 ft. and on a rising grade of about 2 per cent.

These drifts will be cut by jets of water under a pressure of about 2,300 psi. These jet nozzles will be mounted on a rubber-tired, hydraulically operated "jumbo." A low-pressure stream of water will wash the broken gilsonite down a "v"-notch cut in the floor of the drift to the shaft.

At the bottom of the shaft the water and gilsonite fines will be separated and the coarse material crushed to quarter-inch size. The gilsonite-water slurry then will be pumped to agitated tanks on the surface.

When the initial drifts are completed, the "jumbos" will be returned to the shaft, lowered about 10 ft., and put to work cutting another drift.

The pipeline . . . The gilsonite-water slurry will be pumped through a conventional pipeline to the processing plant, a distance of roughly 100 miles.

Detailed tests this month will determine specifications for the line. At present American Gilsonite expects to build an 8-in. line to be operated without intermediate pump stations. Discharge pressure of the pumps will be about 1,800 psi. Pumps probably will be of the plunger-type design.

Feasibility of moving the slurry by pipeline already has been proven by the company through use of a 5-mile line serving its pilot plant near Bonanza, Utah.

The process . . . When the gilsonite-water slurry reaches the processing plant, it will go through a dewatering process using flotation cells, filters, and thermal dryers.

BONANZA, UTAH, and American Gilsonite's mine. Expanded mining operations will center here.

ANALYSIS OF AMERICAN GILSONITE COKE

	Calcined coke
Ash, wt. per cent	Less than 0.5
Volatile	0.5
Fixed carbon	97.5
Moisture (typical)	Less than 1.0
Bulk density	Approx. 1.14
True density	2.04
Resistivity, ohms/M./sq. mm.	*69
Crushing strength, kg./sq. cm.	*362

*Reported for electrode.

Components, Weight Per Cent

Aluminum	0.006
Calcium	0.05
Iron	0.02
Nickel	0.07
Silicon	0.01
Sodium	0.009
Magnesium	0.009
Vanadium	0.001
Sulfur	0.25
Soluble salts	0.08

COWBOY LODE as it looks on the surface. This gilsonite vein will supply the proposed plant for many years. It is more than 9 miles long and is 22 ft. wide at this point.

The dried ore will be melted and heated to about 550° F. and charged to a conventional delayed coker. The overhead from the coker will be fractionated, and the gasoline fraction processed in a two-stage catalytic reformer. The bottoms from the fractionator will be used to melt the incoming gilsonite ore before it is sent to the coker.

The catalytic reformer operation will be unusual in that it will not produce enough hydrogen to satisfy treating requirements. Some hydrogen will be produced from the process gas to make up the deficiency, caused by the high olefin and nitrogen content of the coker naphtha.

According to E. F. Goodner, president of American Gilsonite, the new plant will yield 50 per cent green coke, 35 per cent gasoline, and 15 per cent 1,400-B.t.u. gas.

Economics . . . Goodner said no figures are available yet on the cost of mining and piping the gilsonite to the processing plant.

It is expected that the cost of the delivered raw material would be about $10 a ton, which would be equivalent to about $1.80 crude oil.

Goodner indicated the gasoline produced will meet the octane competition anywhere in western Colorado and that the coke will find a ready market for electrode manufacture.

Background . . . Decision to build a commercial unit was based on several years of research work, development of a process for handling the gilsonite, development of a new mining technique, and construction of a pilot plant in which the process was proved.

A single-drum delayed coking unit with a feed capacity of about 100 tons a day was operated at Bonanza, the center of American Gilsonite's mining operations, during 1954. The plant produced enough coke and distillate fractions to permit extensive treating studies of the distillates and commercial test applications of the coke.

The oil-processing research and pilot-plant operations were directed by California Research Corp.

American Gilsonite was formed, and is equally owned, by Barber Oil Corp. and Standard Oil Co. of California.

Processing of gilsonite by the company will not be the first time the material has been used in refining operations, but it is the first time it has served as the major charge stock for an oil-industry processing operation.

Gilsonite in the past has been blended with bottoms to make asphalt and road oil. It has also been injected as a crushed solid into a crude-oil pipeline and charged with the crude oil to crude and vacuum units.

Significance . . . The American Gilsonite project is a pioneering operation.

Except for the Hidalgo Chemical Co. gas-synthesis plant at Brownsville and the oil-shale plant planned by Union Oil Co. of California, American Gilsonite's operation will be the first privately owned project to make conventional oil products from a material other than crude oil.

The Hidalgo plant, originally built by Carthage Hydrocol, Inc., and later taken over by Stanolind Oil & Gas Co., is now shut down for process changes. Union has not yet started work on its oil-shale plant.

Gas Bill Fate Uncertain

Polls disagree on Harris bill chances; House leaders to decide whether to try for approval this session or next

WASHINGTON. — House leaders were expected to reach a decision over the weekend whether to bring the Harris gas bill up for vote this session.

The immediate fate of the bill to exempt independent producers from federal regulation rests on a count of votes in both parties made last week. Several unofficial polls have been taken.

The results range from defeat by a claimed 20 votes to more than a majority of the full House in favor of the bill. But in the case of the latter the big question was how many of those votes could be depended upon when it came time for members to stand up and be counted just before going home to face their constituents.

What to expect . . . There is little chance the bill will be brought up on the House floor unless its passage is assured.

The rules committee may approve the investigation of pipeline and distributing-company practices and prices asked by Rep. Oren Harris of Arkansas. A probe also of producers' costs was asked by Rep. Charles A. Wolverton of New Jersey.

Harris believes the study, which would be made next session, would develop facts supporting his arguments for exemption of producers.

The rules committee has been sitting on the probe until it finds out what the House does with the Harris bill. The Senate also is standing by. If the House passes the bill the Senate will take it up promptly—and pass it also.

The bill approved by the Senate interstate commerce committee is identical to the House bill except for a single provision. That is that no producer can tear up his contract and stop deliveries if his escalation clause is knocked out.

The amendment was offered by Sen. John O. Pastore of Rhode Island, who presided at the hearings on the bill. In a letter to Pastore, FPC Chairman Jerome K. Kuykendall agreed that the public interest requires assurance of supply.

But he pointed out that the bill, by providing for FPC supervision of contracts between producers and pipeline companies, "obviously contemplates that the contract responsibility of the sellers would insure against abandonment of service, so as to make unnecessary any further limitation on the right of independent producers to abandon."

Prior to the Phillips decision, Kuykendall said, these contracts were viewed as binding and effective. "Independent producers then quite generally accepted the benefits and detriments of their contracts and abided by them," he commented.

Lessee Measure Up

Bill gives wider choice of products to stations

WASHINGTON.—Oil companies would lose all control of their service-station lessees under a bill sponsored by Rep. James Roosevelt of California.

Station operators would be free to sell competitive products. The company could not refuse to extend a lease because of that fact. If it did end a lease it would be prima facie a violation of the Clayton Act. The burden of proof would be on the company, not the operator.

Operators subjected to coercion or loss of leases would be given a free ride through the courts. Even though they did not win their cases they could recover reasonable attorneys' fees and costs from the Government if the trial court held suits were based upon "probable cause."

Roosevelt is chairman of a three-man subcommittee which has been investigating complaints of service-station operators. The other members, Reps. Tom Steed of Oklahoma and Timothy Sheehan of Illinois, did not support the bill or sign Roosevelt's report.

Roosevelt told the House his hearings showed that most major company dealers are operating under short-term leases. They are controlled by the companies and are not in fact independent. Suppliers use their power to restrict the dealer's freedom of choice in dealing in competitive products. They also use their power to start price wars and eliminate competitive or off-brand gasoline outlets. Present laws and enforcement policies provide no relief.

The bill is a "modest" approach to the problem, Roosevelt said. "There is no good reason for any objection to it by the oil company suppliers or suppliers in other industries," he asserted.

Gas Imports Scored

Coal interests to oppose Pacific Northwest's bid

WASHINGTON.—The National Coal Association will ask the Federal Power Commission next week not to approve Pacific Northwest Pipeline Corp.'s plan to import natural gas from Canada.

The association, together with the Fuels Research Council and a number of other coal groups, has asked leave to join in hearings before the FPC beginning July 18 on the ground that the importation of gas "would be contrary to the national interest."

Pacific Northwest was granted a permit last year to build a $160,000,000 transmission system from the San Juan basin to the Northwest states. It is now asking a permit to import 300,000,000 cu. ft. of gas daily from Canada *(The Oil and Gas Journal, June 27, page 68)*.

Robert E. Lee Hall, general counsel for the National Coal Association, said he would tell the FPC that:

. . . **Declining reserve** life index of natural-gas reserves does not warrant the extensions planned by Pacific Northwest.

. . . **Fuels economy** of the West already has been thrown out of balance by previous FPC authorizations.

. . . **New pipelines** and importation of gas would "compound" the damage already suffered by the coal and railroad industries, their workers, and others.

Hall said the coal industry believes the FPC should put brakes on further expansions of natural-gas service.

Compact Approval Nears

WASHINGTON. — Only Senate-House agreement on a single point stands in the way of another 4-year extension of the Interstate Oil Compact.

The difference between the two chambers is over the wording of a requirement that the attorney general report annually whether the compact is being used to limit production or stabilize or fix oil or gas prices.

Research Assured

Bureau of Mines budget approved at $18,863,000

WASHINGTON. — The Bureau of Mines has received $18,863,000 to spend during the fiscal year just started —$6,603,870 of it earmarked for research on fuels.

Congress gave the bureau just what is asked. The fund is $6,637,000 less than appropriated last fiscal year when the bureau received $6 million extra for building new helium plants.

Outlining how the 1956 fund will be used, Acting Interior Secretary Clarence A. Davis said three major programs of petroleum research have been planned.

Studies will be continued on production. These will include secondary recovery research to get data aiding in the most efficient use of reservoir pressure, encourage use of pressure-maintenance in fields where it can increase recovery, and promote use of improved secondary recovery methods in old stripper fields.

The bureau will continue to obtain accurate values for the thermodynamic properties of petroleum hydrocarbons and related substances and for the chemical compounds that may be made from them.

Studies will be stepped up on the basic cause of deterioration of gasoline and distillate fuel oils in storage. The line of approach this year will be the factors that promote instability, effect of controlled oxidation, types of products formed, chemical substances that result in instability, and characteristics of the deterioration products.

In addition to its work on oil, the bureau will have the usual $90,000 for location of new sources and development of more efficient methods of extraction. The actual production of helium will be financed by the bureau's sales of the gas.

New Panel Added to MPAB

WASHINGTON. — Membership of the Military Petroleum Advisory Board has been increased from 24 to 27 to provide for a new gas transmission and distribution panel.

New members of the board, named by Acting Interior Secretary Clarence A. Davis, are: A. W. Lundstrum, president of Ohio Fuel Gas Co., Columbus; Grove Lawrence, vice president of Southern California Gas Co., Los Angeles; and John F. Merriam, president of Northern Natural Gas Co., Omaha.

Lundstrum has been named chairman of the new panel, on which both Lawrence and Merriam will serve.

WATCHING WASHINGTON

Bertram F. Linz

Highway Bill Bogs Down

The administration's big highway construction program shows signs of bogging down in the mud of politics.

The President's program called for a $101,000,000,000 expansion of highways, with the Government's share to be financed in part by a special bond issue. Senate Democrats objected to the bond idea. They came up with a kind of pay-as-you-go substitute.

But House Democrats went further. They offered a bill in which gasoline, diesel fuel, and truck-tire taxes would be boosted to high levels for the next 15 years.

So everybody agrees new highways should be built. But there is sharp disagreement as to how they should be paid for. President Eisenhower has made known his objections to user taxes.

He insists the roads should be paid for either out of current income, which means increased taxes, or a bond issue. The states couldn't finance their share of the cost if the federal gasoline tax were increased, he said.

But the Democrats—and they are in control of Congress—are just as firmly set against the administration plan.

Congress is rapidly getting to the end of the session. Unless these differences are settled there will be no highway bill this year. Congress might pass one of its own versions. But the President might veto it. So everybody is trying to get a bill that will satisfy everybody, so far without much sign of success.

New Texas City Suits?

Refining companies and other oil interests whose property was destroyed or damaged in the great Texas City, Tex. disaster in April 1947 may soon be able to recover damages from the United States.

The Senate has voted to permit the filing of suits against the Government. But only those who filed suits against the United States before April 25, 1950, will be able to enter claims, and compensation will be limited to the amount not covered by insurance.

Over 300 suits were filed following the disaster. They were thrown out by the Appelate Courts because of a gap in federal law which Congress now is filling.

The disaster was set off by the explosion of two shiploads of fertilizer made in government-owned plants. The blasts and fires which followed leveled most of Texas City. More than 570 persons lost their lives and 3,500 others were injured. Property damage ran to uncounted millions.

The Senate judiciary committee, writing the bill, said Congress should recognize "the equitable and compassionate responsibility" of the Government for the damages sustained. Once the bill is enacted, claimants will have 6 months in which to file their suits in the federal court for the southern district of Texas.

Tidelands Change Urged

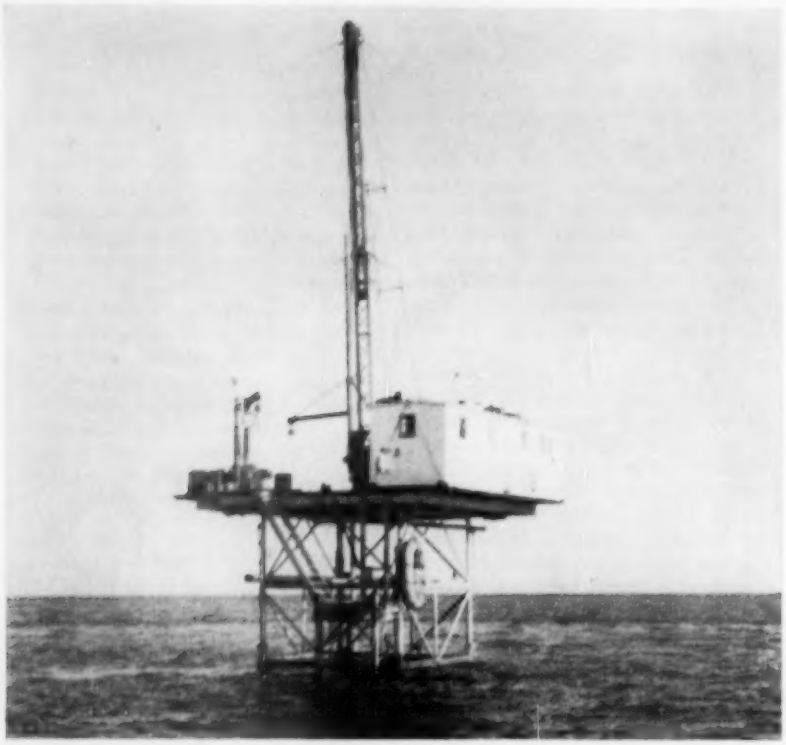
Sen. Paul Douglas of Illinois says Congress fell over its own feet in 1953 when it returned the tidelands to the states.

What happened, Douglas says, was this: The Submerged Lands Act reserves to the federal Government all submerged lands within the 3-mile limit in which it has a "proprietary capacity." The Supreme Court, in the tidelands cases, held that the Government had proprietary rights in all lands beyond the low-water mark. So Congress "gave away" lands which it said in the same law should not be given away.

On the basis of this clever reading of the act, Douglas and 17 other senators are backing a bill adding the area between the lower-water mark and the 3-mile limit to outer Continental Shelf, undisputedly controlled by the federal Government.

Recent developments make this recovery of the submerged lands by the federal Government important in three respects, according to Douglas. One is the big money which their oil and gas resources will bring. A second is that the boundary claims of Texas, Louisiana, and Florida may create international problems as other nations also assert extensions of their territorial waters.

The third is the Louisiana suit. Here the attorney general is not only trying to cut the state's boundary back to 3 miles. He is also validating the claim of Louisiana to the submerged lands out to the 3-mile limit.



Deep water no problem for . . .

Offshore Cable-Tool Rigs

TORONTO. — Drilling an offshore well with a cable-tool rig sounds unconventional. But it has been going on with great success in Lake Erie for 12 years. To date the operator is batting 1,000, with 14 gas producers and no dry holes.

Consolidated West Petroleum, Ltd., Toronto, has two cable-tool rigs working in the lake this season. One is drilling 3 miles from shore in more than 60 ft. of water.

The Toronto company, headed by E. F. Coste, is a veteran of offshore drilling. Its first well was drilled in 1943. Since then, it has completed its string of 14 wells and plans to drill 8 more this year. All are located off Kent County in the southwestern part of the province. Port Alma, operational headquarters for the company, is about 40 miles east of Windsor, Ont.

Consolidated West Petroleum has a daily production of about one million cubic feet from each of its wells. The wells produce from depths ranging from 1,050 to 1,350 ft. in the Guelph dolomite.

The Lake Erie drilling is done from two structural steel platforms mounted on 6-in. tubular steel legs. Both are equipped with Bucyrus-Erie spudders. After a well is completed, the platforms are dismantled and moved to a new location. The platform is leveled by screw jacks on the bottom of each leg. Once the platform is leveled on location, it is secured by cables attached to steel piles sunk in the clay lake bottom.

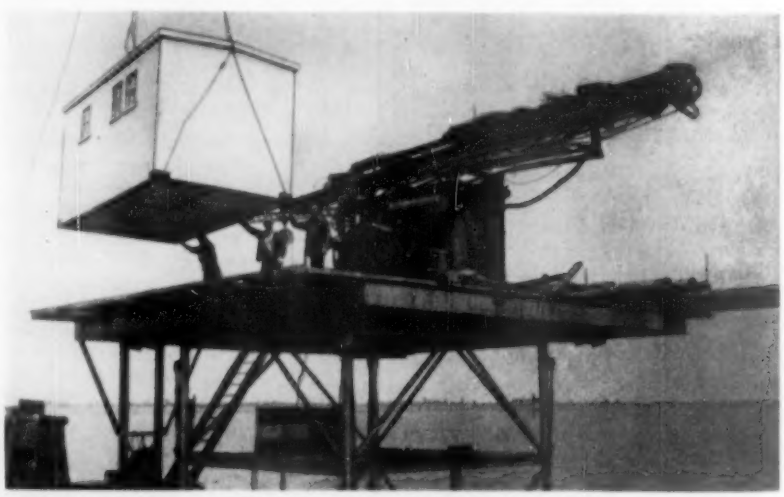
Deep water is no problem for Consolidated West Petroleum. The height of the platform can be adjusted by adding or subtracting the number of tower sections. Most of the tower sections are 16 ft. square and 15 ft. high. Smaller sizes are used to adapt the platform to the desired height. The platform is 32 by 28.

Moving to a new location is a smooth operation, usually taking less than a day. The rig and other platform equipment is moved by derrick barges. But these quick, efficient moves were accomplished only after some costly experiences during early operations.

Consolidated West Petroleum drilled its first well in 1943 a mile from shore. A wooden platform was used in this operation. The well was completed at 1,280 ft. in the fall. The company planned to move the platform before the winter freeze, but was forced to leave it in the lake.

During the winter, floating ice destroyed the platform and ripped off the wellhead, which was about 7 ft. off the lake bottom. The next spring was spent building a new platform and repairing the wellhead. The well was shut in, partially full of water.

The company continued to drill from wooden platforms from 1945 to 1950. It completed four more wells located from a mile to 1½ miles from shore.



FEATHERWEIGHT CHAMPION of offshore drilling equipment is probably this cable-tool rig used in Lake Erie. Consolidated West Petroleum, Ltd., has drilled 14 producers in the lake with cable tools.

These were drilled in water from 35 to 40 ft. deep.

In 1951, the company started using tubular steel platforms. It operated with one platform until this year when a second was added.

Production from the wells is moved to shore through a 3-in. pipeline.

In addition to the steel platforms, the company is testing an aluminum platform. This platform will be used primarily for clean-out work, but can also be used for development drilling.

The Lake Erie wells are believed an extension of the Tilbury gas field, which extends about 9½ miles along the western shore of the lake.

Gas Decision Looms

Alberta vote opens way for Trans-Canada action

CALGARY.—Definite action is expected within the next few weeks by top government officials in Ottawa to firm up the long-proposed Trans-Canada pipeline.

Action is expected to take the form of new financial proposals for an all-Canada line or approval of a plan, revealed some weeks ago, of a gas trade agreement between Trans-Canada and Tennessee Gas Transmission Co.

The gas trade arrangement would bring gas to all sections of Canada and allow time to finance and build the proposed all-Canadian route.

Observers here believe the pipeline deal was allowed to lie dormant during recent weeks until Alberta's election campaign was concluded. It is felt now with Alberta Premier Manning's Social Credit government returned to power, the Liberal government in Ottawa may be prepared to reach some decision.

The pipeline did not become an election issue. Manning long has been a proponent of exporting Canadian gas while the Liberal Party has, until recently, opposed exports.

Financing has been the principal barrier to immediate start on the 2,200-mile all-Canada pipeline linking Alberta gas fields with eastern Canadian markets. The proposed line would cost an estimated $350 million.

A compromise is believed the most likely step. Under the latest proposals being given consideration in Ottawa, a trunk line would be built from Alberta to the Great Lakes. A spur to Duluth would feed into a proposed line of Tennessee Gas Transmission. In eastern Canada a line would be pushed from Toronto to Sudbury. Tennessee Gas Transmission would take 500,000,000 cu. ft. of Alberta gas at the Great Lakes and deliver an equal amount from its system at Sudbury.

Thus Alberta gas would find a big market, and eastern Canada customers also would be served while gaps were being filled in an all-Canadian line which eventually would deliver Alberta gas to eastern Canada without exchange from the United States.

Wildcats Planned

Four-company group plans eight Saskatchewan tests

REGINA.—Eight tests will be drilled in southwestern Saskatchewan by a combine including Canadian Delhi Oil, Ltd., Husky Oil & Refining, Ltd., Phillips Petroleum Co., and Richfield Oil Corp.

Six of the wells will be drilled on a block of approximately 240,000 acres in which the companies hold an equal interest. Two will be on a block of 80,000 acres held equally by Canadian Delhi, Husky, and Phillips. Canadian Delhi is operator for the group.

The group is rigging up at the first site in the series, the Delhi-Husky-Phillips-Richfield 10-2 Leon. Contract has been awarded to Cambridge Corp. The site is 1¾ miles southeast of a dry hole drilled by the combine in 1953. It is 10 miles southwest of the team's Bone Creek Jurassic medium-gravity oil discovery, and 5 miles northwest of the Leon Lake Jurassic strike.

One drilling rig, also under contract from Cambridge Corp., will be used in a development program in Bone Creek medium-gravity oil field where four wells capable of production have been drilled.

The rig currently is drilling ahead in the Delhi-Husky-Phillips-Richfield 10-33 Bone Creek, the northwest offset to the 8-33 Bone Creek producer. It lies ¾ mile northwest of the discovery well.

Canadian Production Up

OTTAWA.—More than half of Canada's crude-oil requirements for July will be supplied by Canadian fields, the Dominion Bureau of Statistics has reported.

Canadian refineries are expected to use 17,800,000 bbl., of which 54.5 per cent or 9,691,000 bbl. will be domestic crude.

Bureau figures also showed that production in Canada was up 31 per cent for the first quarter of 1955 over the similar period of 1954. The country produced 28,596,438 bbl. in the first 3 months of this year compared to 21,824,064 bbl. in 1954.

Natural-gas production was also up from 38 billion cubic feet to 44 billion cubic feet for the 3-month period.

Coleville Field Unitized

REGINA.—Coleville field will be unitized under an agreement approved by the Saskatchewan Department of Mineral Resources.

Nine wells are producing in the field, which has a gas-cap drive. There are 103 tracts within the unit covering 50,820 acres and 468,449.6 acre-ft. of pay zone.

The conservation board last year authorized production of 30,000,000 cu. ft. per day. Coleville field is a source of supply for the Coleville-Brock-Saskatoon natural-gas pipeline owned by the Saskatchewan Power Corp.

Royalite Oil Co., Ltd., is operator for the unit. The major interest is held by Imperial Oil, Ltd., with more than 35 per cent. Canso Natural Gas, Ltd. holds 26 per cent, Royalite 14, and General American Oils, Ltd. 12. Shares of more than 3 per cent each are held by Phillips Petroleum Co., Husky Oil & Refining, Ltd., and Hudson's Bay Oil & Gas Co., Ltd. Alminex is the other owner listed in the unit with .27+ per cent interest.

Canadian Briefs

EDMONTON.—Increased production in Pembina field has brought a reduction of 3 cents per barrel in the tariff on crude oil shipped to Edmonton refineries. Pembina Pipe Lines, Ltd., cut the charge from 19 to 16 cents. Last November, also as a result of increased production, the tariff dropped from 25 to 19 cents.

REGINA, Sask.—Trans Prairie Pipe Lines, Ltd., is seeking permission from the Saskatchewan Department of Mineral Resources to build gathering systems in three fields in the southeastern corner of the province. Trans Prairie wants to build 5 miles in Alida, 14½ miles in Midale, and 6¾ miles in Frobisher field. Lines would be 3 to 6-in.

CALGARY.—Pacific Petroleums, Ltd., will drill about 70 development wells within the next 18 months to supply Westcoast Transmission Co.'s pipeline to British Columbia and northwestern United States. Agreements among Pacific, Southern Production Co., Inc., and Imperial Oil, Ltd., call for a $19,000,000 exploration of Pacific's holdings in the next 4 years.

CALGARY.—Triad Oil Co., Ltd., will build a $1 million office building here. It will be designed as an eight-story structure, but only four stories will be built initially.

Texaco Pembina wells put . . .

Cal-Standard in Spotlight

EDMONTON. — Canadian oil men are looking to California Standard Co. for the next big move in Alberta's Pembina area.

The question: Will Cal - Standard strike oil on the 92,160-acre Cynthia Provincial tract for which it paid $10,500,002 at a recent crown reserve sale?

Cal-Standard acreage is 15 to 25 miles from the main Pembina producing area, but its prospects were brightened last week with announcement by Texaco Exploration Co. that it had brought in five producing wells on an adjoining parcel.

Texaco held up details on its five successful wildcats until after the June 14 crown sale at which it also was a bidder. Cal-Standard, however, won the coveted tract west of Texaco's lease *(The Oil and Gas Journal, June 27, page 70).*

Success now on the Cal - Standard tract would push Pembina field's possible Cardium sand limits still farther west and northwest. Oil men are watching developments in the tract for a clue to possible limits of the field, already the largest in the Western Hemisphere.

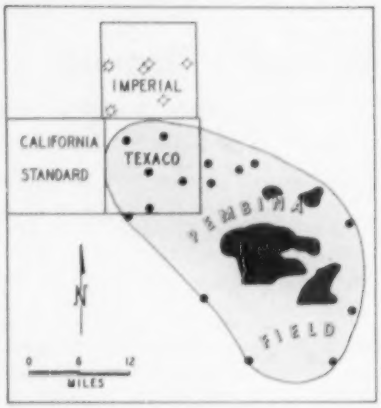
Six failures . . . Northern extension of Pembina apparently has been cut off by the poor showing of Imperial Oil, Ltd.'s drilling program on its Cynthia tract north of the Texaco lease. Imperial paid $11,000,000 for the tract, then drilled six straight dry holes. This caused a serious reappraisal of Pembina's northwestern limits.

Texaco's strikes, however, give new hopes to a westerly trend for the field. Texaco paid $13,000,125 in January 1954 for its acreage. The tract is 90 per cent owned by Texaco and 10 per cent by McColl-Frontenac Oil Co., Ltd. It lies from 4 to 20 miles northwest of the main Pembina producing area.

Pembina already has 670 miles of proven acreage. This includes 429,000 acres compared to 134,612 in the East Texas field. More than 375 wells have been completed in the field. This is believed less than 10 per cent of the number required to drain the pool. Daily production in Pembina is running above 37,000 bbl. with recoverable oil at present estimated at about 1¼ billion barrels. East Texas' daily average production is 207,300 bbl. with a recoverable reservoir of about 5 billion barrels.

Here is a rundown of Texaco's five successful wells:

. . . Texaco-McColl A-12-20 Braemer, completed at 5,485 ft. with Cardium sand at 5,400 ft., perforated Cardium interval 5,405-18 ft.



. . . A-2-21 Dunedin, completed at 5,735 ft., Cardium top 5,640 ft., perforations 5,654-80 ft.

. . . B-4-36 Glendale, completed at 5,663 ft., Cardium top 5,543 ft., perforations 5,546-70 ft.

. . . A-2-27 Aurora, drilled to total depth 10,205 ft. The well was plugged back to 5,422 ft. with the Cardium topped at 5,343 ft. It was completed in Beaverhill Lake zone.

. . . C-10-1 Glendale, completed at 5,900 ft., Cardium top 5,787 ft., perforations 5,790-5,824 ft.

All five of these Texaco Cynthia wells were drilled this year.

The drilling spotlight also may shift even further west if recent bids on leases at the crown sale are any indication. Operators at that sale showed an intense interest in tracts in the Smoky River area of the Foothills Belt in western Alberta. Successful bidders paid more than $2.5 million for five tracts in the rank-wildcat country. Each tract was a parcel of 92,160 acres of undeveloped land *(The Oil and Gas Journal, June 27, page 70).*

Crude Line Hearing Set

CALGARY. — Cremona Pipe Line Co. has announced plans for a 60-mile crude-oil line from the Westward Ho-Sundre area to Calgary. The Alberta Petroleum and Natural Gas Conservation Board will hear the application July 26.

Principal developers of the Westward Ho area are Hudson's Bay Oil & Gas Co., Home Oil Co., Federated Petroleums, Alminex, Ltd., Calgary & Edmonton Corp., and Trans-Border Oils.

Refining Briefs

HOUSTON.—A $1,250,000 refinery building program and other expansions are planned for the new Bay Petroleum Corp., now a subsidiary of Tennessee Gas Transmission Co. R. R. Dean, Bay president, announced the projects for plants at Denver and New Orleans. T.G.T. recently purchased the Bay plants plus producing properties in seven states and Canada in the $20 million deal.

COLORADO SPRINGS, Colo.—Anticipating an almost certain record boom in highway construction in the next few years, the Asphalt Institute has approved an intensified research and development program emphasizing asphalt-mix designs. At the semiannual meeting here, the institute also voted to concentrate on the use of asphalt in soil stabilization, thickness design for flexible pavements, airfield paving for the jet age, and the use of asphalt in hydraulic engineering.

RICHMOND, Calif. — Construction of Standard Oil Co. of California's new 300-ton per day synthetic ammonia plant here will soon be started by M. W. Kellogg Co. The plant will use the Kellogg process of steam methane reforming using natural and refinery gases as feed stocks. Among the design innovations is the reforming step which results in 25 to 35 per cent savings in compressor horsepower, Kellogg said. A special quench-type reactor will allow optimum temperature control contributing to improved ammonia yields and low operating costs. The near-isothermal condition in the reactor will permit longer catalyst life, lower maintenance costs and higher conversion per pass. Much of the ammonia in the new project will be converted in the manufacture of complete fertilizers.

MONTREAL EAST.—Canadian Petrofina, Ltd., is installing $50,000 worth of automatic data-logging equipment in its new 20,000-bbl. per day refinery now nearing completion here. The system, built by Fischer & Porter Co. of Hatboro, Pa., will monitor, analyze, and then record 480 process variables, including temperature, pressure, and flow rate, in the nine processing units of the new refinery. Under normal conditions, the logger will type on a log these process conditions each hour. Between these intervals, it will monitor and report selected conditions, and will sound an immediate alarm and report any abnormal processing conditions.

Offshore Bidders Warned

Louisiana to prosecute firms drilling within 10.5 miles of coast without state approval; leasing still clouded

BATON ROUGE.—The Louisiana State Mineral Board warned offshore oil operators last week that they will be haled into court if they attempt to drill within 10.5 miles of the coast without state permission.

The board's action doused hopes that the federal and state governments will come to terms before next week's lease sales. Both the Interior Department and the State Mineral Board are offering leases in separate sales July 12 on 29 offshore tracts covering about 70,000 acres.

"Notice is hereby given to all interested parties that the State of Louisiana is claiming the exclusive ownership and right to possession and dominion over all of the lands and waters lying 3 leagues or 10.5 miles, seaward from its coast into the Gulf of Mexico," the board announced.

"Any corporation, firm, or individual who seeks to take possession of, or to exploit or develop said lands or waters, for the production of oil, gas, minerals, or other things of value without a lease, license, contract, or other permission from the State of Louisiana will be brought into the courts of said state and appropriate legal action will be taken against them."

Federal action . . . The state's action followed a similar threat made earlier by the Interior Department. Acting Secretary of Interior Clarence A. Davis warned that the department will recommend "appropriate action" to prevent successful bidders in the state sale from drilling in the disputed waters without federal authority *(The Oil and Gas Journal, July 4, page 60).*

The area in dispute lies between the 3-mile and the 3-league boundaries. The federal Government claims Louisiana owns the tidelands only out to the 3-mile mark. The state claims the more distant boundary.

In addition to the 70,000 acres in disputed waters, the Interior Department also is offering leases on more than 600,000 acres beyond the 3-league boundary off Texas and Louisiana.

Operators' views . . . Offshore operators, meanwhile, don't know whether to submit bids to the state, the federal Government, or both.

"It seems like both of them are so far out on the limb that unless both of them backed down, neither could," commented a spokesman for one of the major companies. He pointed out that duplicate bids would tie up bonuses offered until the Supreme Court decides the boundary dispute. "And it's big money," he added.

Some companies frankly admitted they haven't yet decided whether to participate in one, both, or neither of the sales. One spokesman said the decision probably will be made during a weekend of "soul searching" and "night work."

A representative of another company expressed the hope that a "gentlemen's agreement" still may be reached by the governmental agencies. He recalled that the Interior Department made a last-minute withdrawal of several tracts in the disputed territory before its last big offshore sale in 1954.

Another operator expressed the belief that companies can't afford to ignore either sale because "ignoring them would constitute almost a boycott of either one or both of the agencies."

New Firm Formed

Company to specialize in offshore drilling

FORT WORTH.—Coral Drilling Co., Inc., a $2,500,000 Delaware corporation, has set up headquarters here as a contract-drilling firm specializing in offshore operations in the Gulf of Mexico.

President of the company is Ted Weiner, managing partner of Texas Crude Oil Co., Fort Worth. Marvin M. Miller, vice president and assistant general manager of Cosden Petroleum Corp., Big Spring, Tex., and T. R. Weymouth, formerly of Welex Jet Services, Inc., Fort Worth, are vice presidents. Edward L. Hay, manager of land and legal division of Texas Crude, is secretary, and Vernon Jones is treasurer.

Coral Drilling, according to Hay, expects to let construction contract for its first offshore drilling barge by the first of August. Design of the barge, which will cost slightly in excess of $2,000,000 together with the rig, has already been completed. The rig will be large enough to drill "to any required depth."

The barge was designed by Friede & Goldman, New Orleans naval architects. It is a self-stabilizing elevated-deck type which will operate in up to 60 ft. of water.

Coral expects to begin drilling by May 1956. The company plans, Hay said, to consider part-interest drilling deals as well as straight drilling contracts. The barge has not been committed to operate for any oil company, he added.

Temporary coastal operating offices have been opened in New Orleans at the Texas Crude Oil Co. offices in the Shell Building. Hay said the company soon will hire a drilling superintendent or operating manager with experience in offshore drilling operations.

Navy Leases Net $611,750

GALVESTON, Tex.—Placid Oil Co. of Shreveport was high bidder on four of five oil leases sold by the Government on the Camp Wallace military reservation. The bonus total was $611,750.

The fifth lease, for 313.7 acres, went to John W. Mecom of Houston for $73,719.50.

Actual delivery of the leases was held up pending final action on a protest against the sale.

The protest was filed by Albert J. Delange of Houston on behalf of the original owners of all but 7.88 acres of the leased land, which had been acquired by the Navy by condemnation. The original owners contended that the oil rights, if not needed by the Navy, should be returned to them.

The Bureau of Land Management, which sold the Galveston County leases, awarded three 313.7-acre tracts to Placid for bonuses of $16,833.15, $52,281.25, and $260,771.87. The fourth was for 314.6 acres and brought $208,144.07 at the July 6 sale.

Barge to Be Repaired

NEW ORLEANS.—Contract for repair of the $2,000,000 drilling barge which capsized in the Gulf of Mexico last month is expected to be let this week by American Tidelands, Inc.

The big barge was towed to dry dock last week after being hoisted back to floating position *(The Oil and Gas Journal, July 4, page 61).* It capsized about 5 miles off Grand Isle June 17 after completing its first well for Humble Oil & Refining Co.

Drilling Marks in Peril

Richardson-Bass wildcat at 19,752 ft. already deepest for Louisiana; may go to 22,500 ft. to crack world records

NEW ORLEANS. — Richardson & Bass 1 LL&E - Humble - "L," already by far the deepest hole ever drilled in Louisiana at 19,752 ft., may crack a couple of world "deepest" records before it's through.

One of the endangered marks is the world's deepest production mark established in December 1953 by Richfield Oil Corp. 67-29 C.L.A. which found condensate production at 17,500-17,895 ft. in North Coles Levee field near Bakersfield, Calif.

The other is the world's deep-drilling record set by Ohio Oil Co. with its 72-4 Kern County Land Co.-A in Paloma field of Kern County, California. Ohio reached a total depth in this test of 21,482 ft.

Pay zones tested . . . The Richardson & Bass wildcat is about 35 miles southeast of here and about 5 miles northeast of Lake Washington field in the marshy Mississippi River Delta area of Plaquemines Parish.

It reached its present depth in Miocene shale by July 1. This was 1,092 ft. below the former Louisiana depth record set by Magnolia Petroleum Co. in a 1952 venture in Allen Parish which went to 18,660 ft.

Drilling was suspended by Richardson & Bass at 19,752 ft. to test possible pays up the hole. Over the July 2-3 week end, operator spent 72 hours running logs and conditioning hole to run 7-in. liner. Tests are expected to take another week.

Gas-condensate shows have been logged in the well at 16,600, 17,250, 18,500, and 19,035 ft. If either of the two deeper shows should develop commercial production, the Plaquemines Parish test would be the new world's deepest producer.

Deepest producing well currently in Louisiana, as well as the world's second deepest producer, is Humble Oil & Refining Co. 2 Rita Provost-Minvielle in Weeks Island field of Iberia Parish. The Humble well was completed in October last year producing gas-condensate at 17,530-54 ft.

Drilling mark threatened . . . Ed Hill, vice president and general manager of Richardson & Bass at Fort Worth, said last week that the hole may not be taken deeper if the tests develop commercial production.

If they do not, he said, drilling will continue to about 22,500 ft. unless undue trouble arises. This would be more than 1,000 ft. below the depth reached by Ohio Oil in the Paloma field record holder. "We're much interested in exploring further and have the pipe and equipment to go to 22,500 ft.," Hill said.

Besides the Paloma well, only two others have gone deeper than the Richardson & Bass project to date. These were Superior Oil Co. 1 Unit, a 20,521-ft. wildcat drilled in 1949 in Sublette County, Wyoming, and George Vasen 1 Fee in Stone County, Mississippi, which went to 20,450 ft. in 1953.

Rapid drilling rate . . . Along with being noteworthy as to depth, the South Louisiana wildcat has been drilled remarkably fast. The well was spudded in February 27, requiring only 122 days to reach present total depth. So far, there have been no fishing jobs.

Rig on the project is Richardson & Bass' No. 25, a National 34-10 steam unit with five boilers. The rig is mounted on a barge built by the Livingston organization in 1947.

A string of 20-in. surface pipe was set in the hole at 302 ft., 13⅜-in. at 3,003 ft., and 9⅝-in. at 13,656 ft. Hole is open below that point. Operator has been using 17.9-lb. mud since last string of casing was set.

Associated with Richardson & Bass on the venture are John W. Mecom of Houston and Freeport Sulphur Co., New Orleans.

Processing Plant Planned

CORPUS CHRISTI. — Construction of a natural gasoline-L.P.G. plant to process gas from Redfish Bay-Mustang Island field has been announced by Sunray Mid-Continent Oil Co., which will operate the facility.

The plant will be jointly owned by 12 producers of gas from 49 wells in Nueces County. It will be located in San Patricio County, near Ingleside, about 1 mile north of the present Redfish Bay compressor station operated by Sunray and owned by several companies.

Dresser Engineering Co. has the construction contract for a reported $3,000,000. Sunray would not confirm the figure.

Construction will begin September 1. Completion is scheduled next February.

The low - temperature, oil - absorber type plant will be designed to handle 140,000,000 cu. ft. of gas per day, with 80 per cent propane recovery. It will have dehydrating facilities.

L.P.G. and natural-gasoline production capacity will be 125,000 gal. per day.

Gulf Fields Found

Two strikes bring total to 16 off Louisiana this year

NEW ORLEANS.—Two more new fields were found last week in Louisiana's Continental Shelf areas.

They make a total of 16 discoveries this year in these offshore regions.

One of the new discoveries was by Sinclair Oil & Gas Co. in the Timbalier Bay area of the Gulf of Mexico off Lafourche Parish. Its discovery well, on State Lease 2490, in Block 15, flowed at the rate of 138 bbl. of 55.2°-gravity condensate with 1,680,000 cu. ft. of gas per day on its completion gage through ¼-in. choke.

Flow was under pressure of 4,300 psi. Shut-in pressure is 4,600 psi. Production is from Miocene sand, perforated at 11,986-96 ft. The hole was drilled to 13,756 ft.

The other new discovery was by Kerr-McGee Oil Industries, Inc., and Union Oil Co. of California, joint operators, in Breton Sound, off the east coast of Plaquemines Parish. It is on State Lease 1268, in Block 47, Main Pass area.

Testing Miocene sand, perforated at 8,192-8,201 ft. and 8,212-18 ft., the well flowed at the rate of 187 bbl. of 30.2°-gravity oil per day through 5/32-in. choke. Pressure was 750 psi. with a gas-oil ratio of 576 cu. ft. per bbl. Flow rate was based on a 6-hour gage.

Other potentially productive sands encountered by the well, drilled to 8,600 ft., will be tested before completion is made.

This is the fourth field Kerr-McGee has found in its extensive Breton Sound exploration. Its new discovery is on a block of 11,666 acres.

New Firm to Expand Offshore

HOUSTON.—Mecom Petroleums, a limited partnership formed here last week, plans to spend at least $25,000,000 in the next 3 to 5 years developing oil and gas properties in the Gulf of Mexico and South Louisiana.

The partnership was formed by San Jacinto Petroleum Corp. and John W. Mecom, Houston independent. Offices will be maintained in both Houston and New Orleans.

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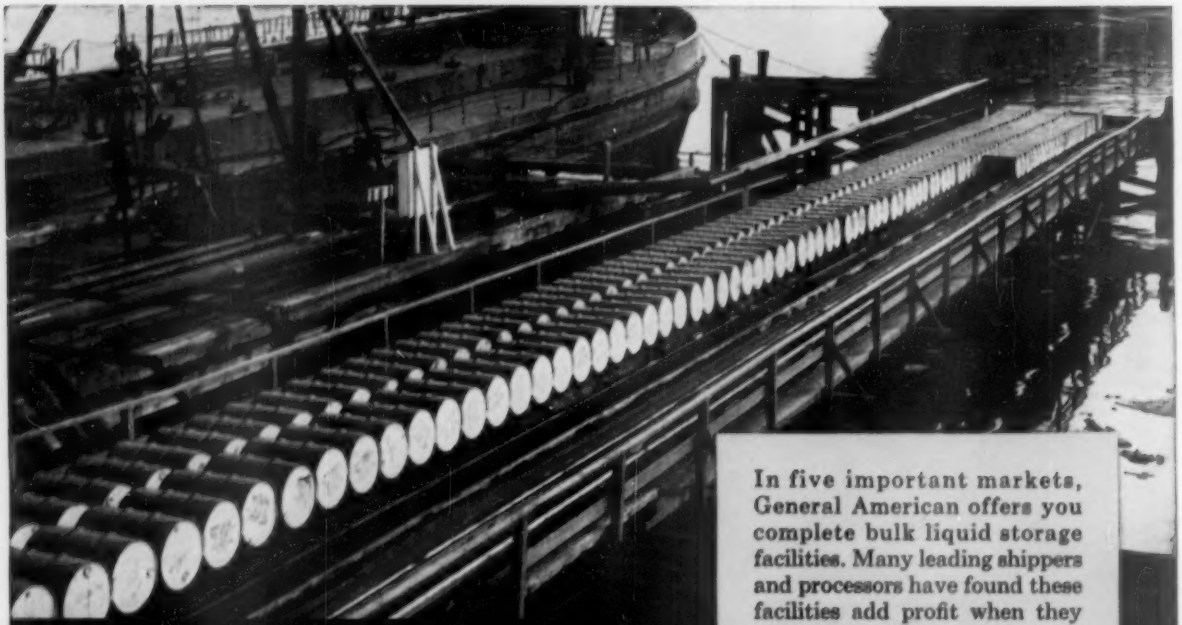

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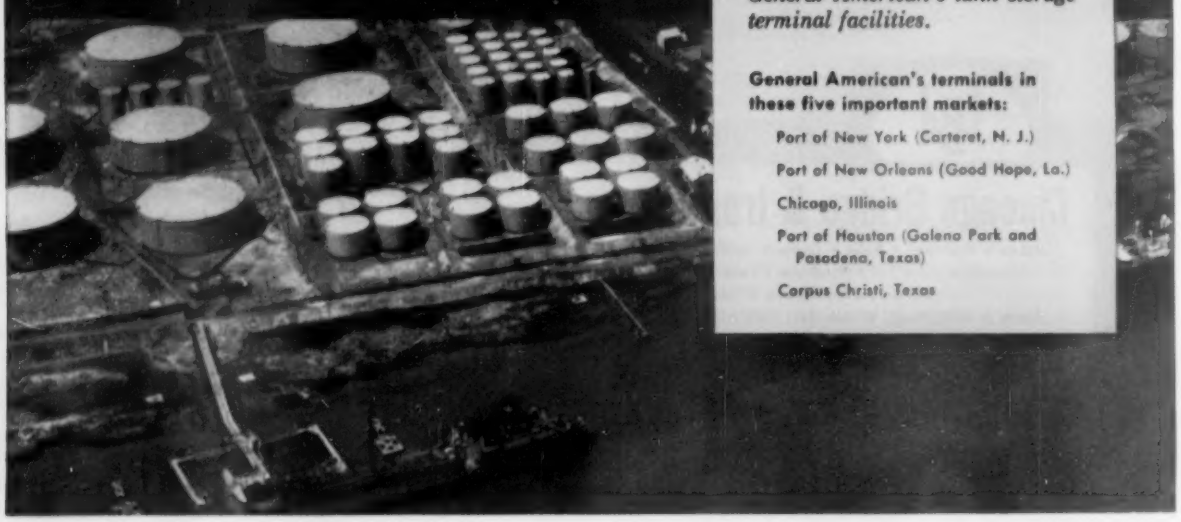


SOUTHWEST

Toyah Extended

West Texas gas field has new pay zone in prospect

ODESSA, Tex.—Toyah gas field of Reeves County, West Texas, has a new pay zone in prospect at Gulf Oil Corp. and Phillips Petroleum Co. 3 Toyah Unit, formerly 1-MM.

This one-well Devonian field is important because it is the only deep production on the Texas side of the Delaware basin with possibilities of being economical. Gulf and Phillips 1 Shurtleff, discovery of the field, was completed last year for 65,000,000 cu. ft. of gas from the Devonian. This is by far the largest well so far found in that formation within the basin.

Now the operators have hopes of adding a second pay formation to the field. More than casual interest is shown in the new pay because all three (one completed, two extension offsets drilling) wells have had strong gas kicks above the Devonian. It was thought the gas kicks were from gas pockets, which would soon blow out, and no tests were run in the higher sands while drilling the discovery and a northeast offset.

Long test shows gas . . . An 8-hour drill-stem test at 3 Toyah Unit in a Pennsylvanian sand at 11,120-11,372 ft. flowed gas at the rate of 6,500,000 cu. ft. the first hour, under pressure of 380 psi., with a slight increase noted the eighth hour of flow. There was approximately 40 bbl. of fluid an hour with the gas. The well is 1 mile northwest of the discovery.

Gulf and Phillips 1-KK Toyah, 1 mile northeast of the discovery, did not test above the Devonian. At last report the well was flowing gas at the rate of 6,973,000 cu. ft. per day, from Devonian, or Siluro-Devonian, at 12,710-92 ft. Surface pressure was 270 psi.

Basin exploration . . . Previous discoveries on the Texas side of the basin have been of short duration. Devonian gas production was found on the Grisham ranch in Culberson County, and Magnolia Petroleum Co. had Wolfcamp oil at 10,882 ft. in Cable field, southeastern Reeves County, but neither proved commercial.

Toyah field is thought to be the largest geophysical anomaly yet uncovered within the Delaware basin boundaries. It lies near the geographic center of the basin, and successful development would shed new light on deep exploration of the basin.

McRae Buys Intercoast

MIDLAND, Tex.—McRae Oil & Gas Corp. of Denver has purchased all the stock of Intercoast Petroleum Co., Inc., Midland, Tex.

J. A. McRae, president of the firm bearing his name, revealed the stock was bought from Chesapeake Industries, Inc. He did not disclose price.

Intercoast holds interests in 68 producing wells in West Texas and New Mexico and has a daily net production of about 500 bbl. The firm's Midland headquarters office will be retained by McRae as headquarters for all of McRae's West Texas activities.

McRae Oil & Gas prior to the purchase owned wells in Colorado, Wyoming, Oklahoma, Texas, and Montana. It also owns Roden & McRae Drilling Corp., which has offices in Denver and Casper, Wyo. Principal stockholders include Robert Young, of the New York and Central Railroad, and William Zeckendorf, head of Webb & Knapp.

MID-CONTINENT

Wildcat Flows Gas

Harper County discovery spurs drilling interest

LAVERNE, Okla.—The search for oil and gas is on again in the quiet northwestern region of the Anadarko basin as a result of Sun Oil Co.'s wildcat gas discovery in Harper County.

Sun's 1 Holmes flowed 7,000 M.c.f. of gas per day on test of the Morrow-Penn sand at 7,000-30 ft. A drill-stem test in the Oswego-Penn at 6,305-10 ft. recovered 430 ft. of free gas and 20 ft. of oil and gas-cut mud.

The important find, reviving exploration interest in extreme northwestern Oklahoma lies between the inactive Laverne and Stockholm area fields. The nearest heavy drilling activity is more than 30 miles northwest in Beaver County's Mocane area.

Stockholm field was opened in 1929 by Sinclair's 1 Howell which flowed 10,000 M.c.f. of gas per day. Laverne area fields were brought in by Sunray Oil Corp. in 1952 with gas-condensate production from the Mississippian.

Since then drilling has been at a virtual standstill in Harper County.

But prospects of the Sun well have given leasing activity a shot in the arm in neighboring Ellis and Woodward counties. Sun has taken additional acreage in the southern part of Ellis County.

Deep Rock Buys Kansas Wells

TULSA.—Deep Rock Oil Corp. has bought 28 producing oil wells in Barton County, Kansas, from W. L. Hartman. The wells are in the Fort Zarah and Hammer pools in the southeastern part of the county.

Deep Rock stockholders are scheduled to vote this week to change the corporate name to Crescent Corp. President W. H. Garbade said that Crescent would take over operation of the Kansas properties immediately and planned additional development wells.

The wells produce from the Kansas City and Arbuckle zones at depths of about 3,200 ft. Crescent's production will be about 400 bbl. daily. R. D. Micheals will be in charge of operations with headquarters at Ellinwood, Kan.

Derby to Add Ultraformer

WICHITA.—Derby Refining Co. has let contract to J. W. Pritchard Co., Kansas City, for a 2,500-bbl. Ultraformer at its 24,000-bbl. refinery here.

The new unit, part of a $700,000 expansion program, can be enlarged later to 4,000 bbl. daily. The unit will enable Derby to produce 100-octane gasolines without a TEL additive.

The Ultraformer is being licensed from Standard Oil Co. (Ind.).

Aramco Production Down

Iran's reentrance into market holds Arabian crude below 1954 mark; Ghawar field extended to include Haradh area

CRUDE production in Saudi Arabia this year probably will be less than in 1954.

This prediction was made by F. A. Davies, board chairman of Arabian American Oil Co., which handles all Saudi Arabian production. Discussing Aramco operations in the 1954 annual report, Davies said that sales forecasts indicate that the normal growth of markets for Middle East oil during the next 2 years will not be sufficient to offset the expected production from Iran. Output in the kingdom last year averaged a record high 953,000 bbl. daily, against 844,642 bbl. daily in 1953.

Production figures for the first 5 months of this year bear out Davies prediction. Through May, Saudi Arabian output averaged 956,000 bbl. daily, off 11,700 bbl. daily from the same period last year.

Field extended . . . Exploratory wells indicated that the Ghawar field extends to and includes the Haradh field to the south. One of the world's most important oil fields, Ghawar has about 130 miles of probable uninterrupted production. The field consists of five areas, each a big field in its own right. The thickness of the pay zone in the three areas now in production averages about 142 ft.

At the end of the year, 141 wells were producing crude. On an annual basis, each well had an average yield of more than 6,600 bbl. daily. Sixty-three wells in Ghawar field have an average output of more than 10,000 bbl. daily.

Expansion planned . . . Aramco plans to develop production in Safaniya field, located on the Persian Gulf, by 1957.

Plans include the construction of a pipeline from Safaniya to Ras Tanura, and the installation of a gas-oil separation plant and pump station at the field. Most of the construction will take place next year.

Refinery expanded . . . New installations in 1954 included a gas-injection plant at Abqaiq. The plant recycles 150,000,000 cu. ft. of gas daily to help maintain reservoir pressure at Abqaiq field. Work also was begun on an $11,700,000 fluid Hydroformer at the Ras Tanura refinery. The 12,500-bbl. unit is scheduled for completion this month.

Crude refined at Ras Tanura averaged about 218,800 bbl. daily in 1954, up more than 14,000 bbl. daily from 1953.

Rudderless Tanker Launched

The first of a fleet of nine rudderless tankers was recently launched in England for products transportation along the river estuaries around Britain.

The BP Haulier, built for Shell-Mex and B.P., Ltd., is the first tanker equipped with a Voith Schneider propeller, which both steers and propels the 2,000-bbl. capacity vessel. The prop blades can be feathered to give thrust and manipulated to give forward or reverse motion.

Owners of the vessel, the distributing organization in England for British Petroleum and Shell groups, believe the new propeller will help the 148-ft. vessel make the sharp bends and limited waterways on the Medway and Thames estuaries.

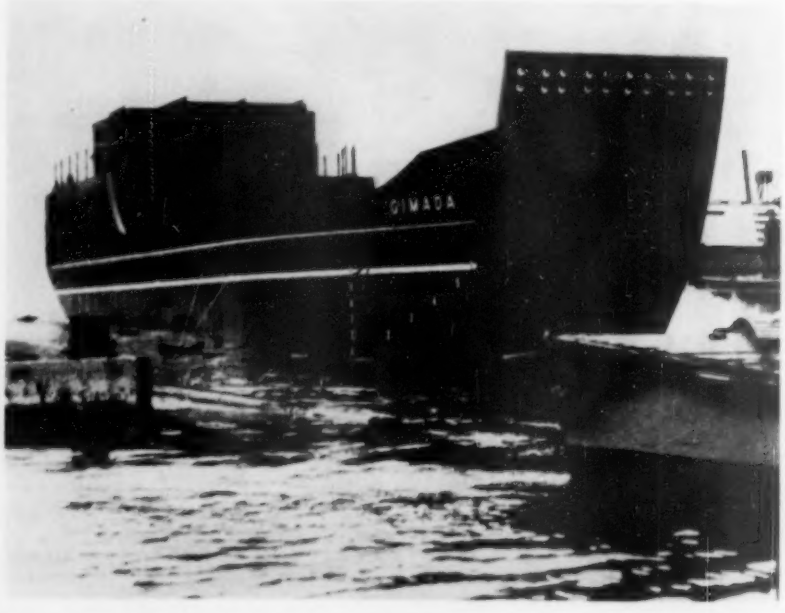
Feldman Expands Operations

D. D. Feldman Oil & Gas, Dallas independent, which recently entered foreign operations with ventures in Cuba and Canada, now is moving into Europe and the Middle East.

The company revealed last week that it was opening an exploration office in Paris to direct Europe-Middle East operations. Heading the office will be Roger Henquet, owner and manager of Societe d'Etudes Petrolieres, Paris.

Henquet was executive vice president and general manager of Schlumberger Corp. at Houston for 6½ years before going to Europe as manager of European and Middle Eastern operations for Superior Oil Co. He was associated with Superior for 3 more years before setting up his own organization.

D. D. Feldman Oil & Gas has domestic offices in New York City, Los Angeles, Lafayette, La., and Houston, Midland, and Corpus Christi, Tex., in addition to Dallas.



Special Landing Craft Designed for Papua Search

Travel in reasonable comfort is limited to air or water in Papua, in southeast New Guinea, and new landing craft like this one are Australasian Petroleum Co., Pty., Ltd.'s latest answer to the problem. Helicopters are used for carrying food and light stores, but they can't haul drilling gear and other heavy equipment. Rivers are the best means of transportation, and three specially-designed twin-screw landing craft like this one were ordered built in Britain for the exploration company. Two have been launched and the third is nearing completion. Each can carry 120 tons of equipment.

Russians Return Field to Chinese Reds

This remote northwestern China fie'd, once operated as a joint Russian-Chinese venture by the Sino-Soviet Petroleum Enterprise, has been turned over to the Chinese Communist Government by the Russians. It is operated by Sinkiang Petroleum Co., according to Eastfoto agency. The field is said to be west of Mongolia and north of Tibet. Communist reports, as usual, gave no actual production figures, but claim 1954 production was 26 times as great as 1951. "Specialists and equipment from the Soviet Union" were credited with creating a "modern, efficient oil undertaking" in the field. The Russian pullout was made without explanation.

Oil Hunt to Jordan

30-year concession won by California operator

EDWIN C. PAULEY, California oil operator, has apparently been granted an exploratory concession in Jordan.

Reports from Jordan last week were that the Minister of Economy had approved the 30-year concession, but they failed to give details as to acreage or location of the concession.

Based on the 50-50 profit sharing basis, the concession can be cancelled within 6 years of the time it is signed by the Jordan Council of Ministers if Pauley fails to find oil in that time. The agreement according to reports provides for a payment to Jordan of $50,000 within a week after exploration begins; another $50,000 in the first 2 years; $100,000 in the second 2 years; and $200,000 in the following 2 years.

German, Swedish, and Belgian oil companies are understood to be seeking concessions in Jordan also. The Jordan Government is dealing with the companies separately, and reports last week indicated the Pauley concession does not conflict with those sought by the other companies.

Less than 6 months ago, Dr. Louis Gardner, American oil adviser to the Jordan Government, made an optimistic report on the chances of finding oil in Jordan. He pointed to what he called four favorable factors in the western part of the Middle East kingdom, once the northern part of Palestine.

He listed them as:

. . . **The geographical** position with relation to other Middle East production.

. . . **The nature and** thickness of possible reservoir rock.

. . . **Presence of surface** asphalt seeps and oil stains.

. . . **General similarity** of the geology to other producing countries.

The Jordan Government has sought to interest foreign capital in exploration and last year invited proposals. The government stipulated it would consider no company which had interest in Israel.

Butadiene Plant Planned

West Germany will be the first country in Europe to use the single-step Houdry dehydrogenation process to convert normal butane to butadiene, one of synthetic rubber's basic raw material.

The plant will be built at Marl, Kreis Recklinghausen, by Chemische Werke Huels A.G. and operated by a new company of which Chemische Werke will be half-owner.

The plant's annual production of about 40,000 tons of butadiene will be used to make synthetic rubber. The new unit is the first step in the development of a modern synthetic-rubber industry for West Germany.

Houdry will do the process engineering and part of the mechanical engineering for the unit. No contractor had been named last week.

Dr. Paul Baumann, managing director of Chemische Werke Huels, said the Houdry process was selected because of its single-step nature and the fact that increased refinery production of higher-octane gasolines in West Germany and Western Europe is expected to make butane available as a raw material.

Egyptian Well Completed

International Egyptian Oil Co., Inc., has completed its Belayim No. 3 well in Egypt's southern Sinai Peninsula for an initial flow of 63 bbl. an hour through a ½-in. choke.

The well is producing clean 23.4°-gravity oil from the 7,633-7,816-ft. interval.

The company set 5½-in. casing at 5,230 ft. in its No. 4 well of the same field and tested the upper oil sands at a rate of 240 bbl. daily. The field's No. 2 well is drilling ahead below 8,400 ft. It will test the lower Miocene sands expected below 8,500 ft.

International Egyptian is owned jointly by Belgian, Swiss, and Italian interests, with Southern California Petroleum Corp., a minority interest holder, the operating company.

International Briefs

The first Houdriflow catalytic cracking unit to be built in the Orient has gone on stream at the 14,000-bbl.-daily Yokkaichi refinery of Daikyo Oil Co., Ltd., Tokyo. The new unit will upgrade 4,200 bbl. daily of gasoline.

Another member company of the Caltex group has changed its title to conform with the family name. The French affiliate, Raffineries de Petrole de la Gironde has changed its name to Caltex S.A.F.

Oil Top Soviet Export

Some observers believe Russians have accumulated large military stockpile as 1954 shipments hit 32,400,000 bbl.

OIL last year replaced grain as the top export commodity of the Soviet Union and Romania, United States officials disclosed last week.

Exports of Soviet and Romanian oil products amounted to 32,400,000 bbl. in 1954 compared to 12,200,000 bbl. in the previous year.

These figures were revealed in a study made by the strategic trade controls office of the Foreign Operations Administration, which recently became the International Cooperation Administration.

The export figures compiled by the U. S. agency represent only about 2 per cent of world consumption of petroleum, but exports are a sizable part of Russia's annual production, an estimated 1,140,000 bbl. daily. Last year this was especially true in view of the fact that Russia is not believed to have a surplus of crude or products.

The ICA study regards Russia's sharp increase in products exports as an arbitrary diversion from domestic use because the Soviet Union urgently needs foreign exchange income.

In the Russian economy, civilian consumption of oil is relatively minor when compared to the western world. The oil burners and automobiles, which make a large part of the U. S. market, are not found in the Soviet Union. Russian output of oil has in the past been largely channeled into essential industrial uses and to the military.

Surplus accrued . . . Increasing exports of oil from behind the Iron Curtain during the past 2 years lead some observers to believe the Soviets have built up a large military stockpile of oil and now they are aiming at barter deals with the West.

The biggest buyers of Soviet oil are Finland, France, and Argentina. The Russians are supplying almost all Finland's and Iceland's needs. Other buyers include West Germany, Egypt, Israel, Turkey, and India. Argentina just a month ago concluded a new trade agreement with Russia which calls for the shipment of about 360,000 bbl. of crude and about 360,000 bbl. of gas oil from Russia in exchange for linseed oil, wool, and meat from Argentina.

In a few cases these countries may have bought Soviet oil because it undercut the world market. It is more likely, however, that the deals were backed by a desire to cultivate better relations with Russia or because the Soviets would accept barter terms. British and American oil interests abroad are based on sterling or dollars, and both are in short supply with many prospective oil buyers.

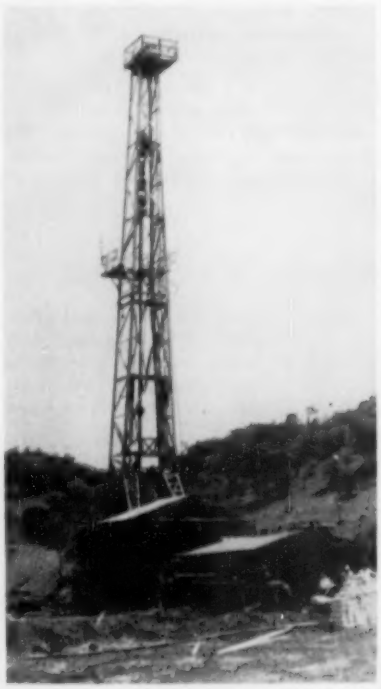
Luzon Conflict Negotiated

Philippines Oil Development Co. and Standard-Vacuum Oil Co. are negotiating conflicting oil exploration claims in the Cagayan Valley of northern Luzon.

One solution to the problem, which Manila reports say is under consideration, would be to divide the disputed area into three parts. Podco would have first choice and Stanvac second. Podco would receive the remaining section.

Stanvac would have no interest in the first section, but Podco would have an option to one-third participation on Stanvac's concession. Stanvac would have a similar option on the third section.

Podco is a local Philippine company which has carried on sporadic exploratory work in the islands for several years. It has an agreement with American Overseas Petroleum, Ltd. (Caltex), under which Amoseas is to handle Podco operations in the Cagayan Valley. According to Manila reports, Podco would be free to carry out its agreement with Amoseas on the first section, in which Stanvac would have no interest.



First Jamaican Wildcat

Base Metals Mining Corp. claims commercial oil production may be established soon in Jamaica as a result of its first test in Negril area on far west tip of island. Although determined to be well off structure, the wildcat picked up several promising shows of gas and residual oil between 760 and 3,773 ft. in penetrating 6,300 ft. of sediments. The company plans a stepped up exploration and drilling program (The Oil and Gas Journal, June 27, page 79).

Aussie Well Shows

WAPET's Rough Range 1A tests 897 bbl. in 20 hours

PROMISING show of oil has been reported in western Australia at a development well drilled alongside the region's discovery test.

The well is Rough Range 1A drilled by West Australian Petroleum, Ltd. It has tested better results than the discovery well which caused a flurry of oil excitement late in 1953.

Rough Range 1A produced 897 bbl. of crude on a 20-hour test through ½-in. choke. Gross fluid production during the test amounted to 1,108 bbl. The discovery wildcat tested only 550 bbl. daily. Production at both wells was from a basal Cretaceous formation at 3,605-20 ft.

WAPET, which is owned 80 per cent by Caltex and 20 per cent by Ampol Exploration, an Australian firm, is conducting further tests on various chokes to determine how the well holds out.

WAPET up to this year has spent $11,500,000 in West Australia drilling and has a $9,000,000 budget for exploration this year. Drilling results have been disappointing on the Rough Range structure after the initial discovery which finally was abandoned at a depth of 14,000 ft. after a drilling mishap. It was the deepest well ever drilled in South Pacific. Five stepout wells were drilled from the discovery test. All were dry. Finally WAPET decided to sink a test only 30 ft. from the discovery.

The company has no other wells drilling in the immediate vicinity. Nearest activity is WAPET's Cape Range 2 well, about 25 miles north. Rough Range is located in the Exmouth Gulf area, 600 miles north of Perth on Australia's West Coast.

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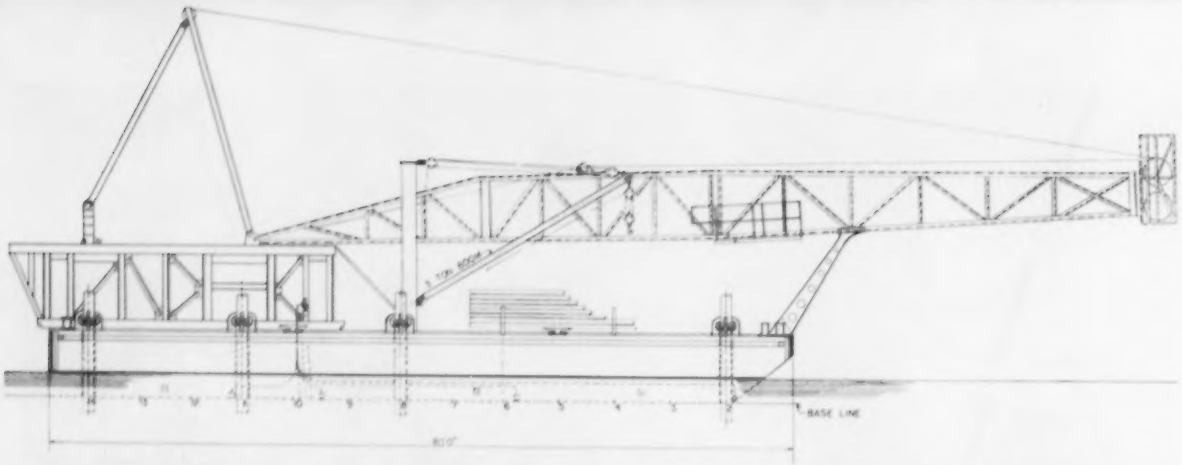


STRIPPED BARGE profile shows the 96-ft. mast and the 3-ton boom used for loading pipe and heavy supplies. Spud pilings operate independently to fit uneven lake bottom.

It started in 1910 . . .

The first successful overwater drilling in the United States, and probably in the world, was done by Gulf Refining Co. on Caddo Lake near Mooringsport, La., in 1910 and 1911. Cypress trees from around the lake were cut for piling on which to set the rig. Barges and boats were used for setting up the rig and supplying it, which, at that time, were spectacular operations. Through December 1954, Gulf had drilled 416 holes in Caddo Lake and its tributaries.

During August 1952, Caddo Levee Board "N" 282 well was completed as a producer in the Pettit lime at a depth of approximately 5,200 ft. This started a new drilling program for the lake. The drilling platform for this well required approximately 9,600 lineal feet of piling (215 piles) and approximately 59,000 board feet of timber. This platform was designed for 8,000-ft. wells and cost about $30,000. After revising the platform for 6,000-ft. drilling, the cost was reduced to $26,000.

With this $26,000 for a drilling platform added to the other usual attendant drilling costs, such as footage rates and day rates, and the high cost for moving from one location to the next and rigging up and down, all done over water, the total cost to complete the Pettit wells was considerably higher than a comparable operation on land.

These overwater operations received concerted study with the goal in mind of materially reducing the completed well cost. It was determined that the cost of the drilling platform could be reduced approximately $13,000 per location by constructing a tender barge to carry the active and reserve mud pits, and mud pumps, mud-storage house, and bunk house.

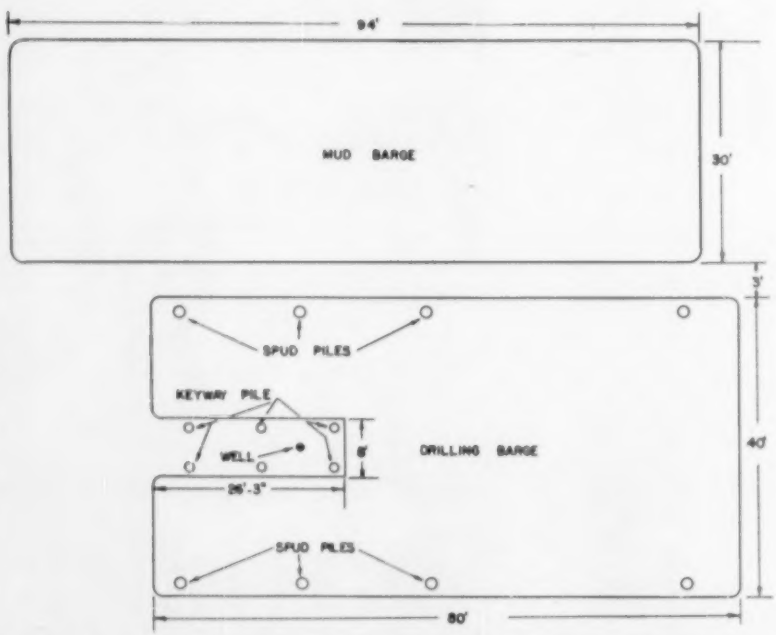
New Caddo Lake Drill Barge

Steel spud piling holds unit in position

by C. W. Chachere

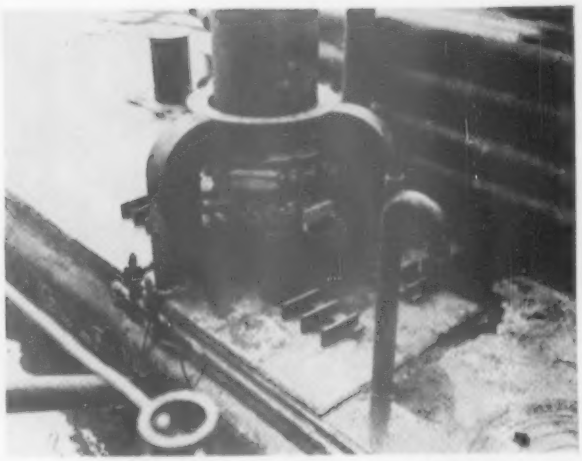
A DRILLING-TENDER barge 94 ft. long, 30 ft. wide, and 6 ft. 6 in. deep was constructed on the bank of Caddo Lake and put into service during July 1953, at a completed cost of $35,000. The savings effected paid out this barge on three wells. Further development of the field indicated a number of additional wells might be drilled. The success of the mud-tender barge and the possibility of continued drilling in the lake spurred efforts toward development of a movable drilling structure suitable for Caddo Lake.

It was determined that hydraulic free-type pumps would be used as the method of artificial lift when the wells ceased to flow. No conventional pump-



PERMANENT WELL PILINGS are driven before the barge is moved into position. Barge keyway is fitted onto piles and allows continuous drilling even when barge is adjusted to changing water levels.

HYDRAULIC JACKS are used to drive and pull pilings. The piles are first dropped through the barge and penetrate into the lake bottom about 5 ft.



PILING CLAMPS which secure the barge may be adjusted to allow the barge to be raised or lowered as the lake level changes.

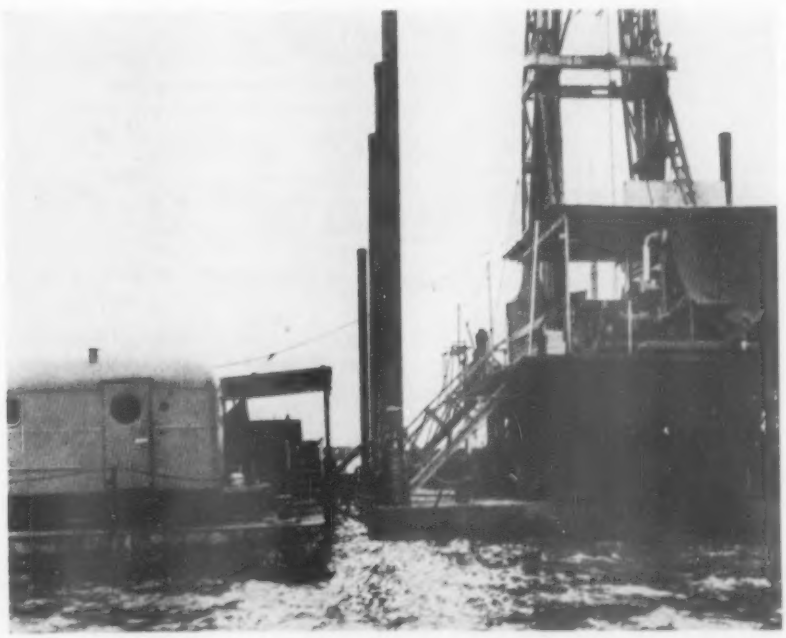
ing unit is required for this method of operation and, therefore, no large permanent piling platform would be needed for producing the wells. All available data were gathered concerning the lake and storm conditions to be expected.

The standard type of drilling barge used in shallow waters of the Gulf Coast was not suitable for Caddo Lake as the bottom contours so vary that the normal average water depth ranges from a few inches up to 14 ft. and, in the spring, flood conditions often cause a rapid rise of 6 to 8 ft. The unevenness of the lake bottom and the presence of stumps make it impractical and uneconomical to use a submergible barge which rests on the bottom.

Barge selected . . . From these studies several means were developed for drilling on Caddo Lake. After analysis of the proposed structures and conferences between company personnel and marine design engineers, a barge to operate from the lake surface was selected. The barge was to be 80 ft. long, 40 ft. wide, and 7 ft. deep and capable of withstanding 60-m.p.h. winds and 5-ft. waves. During drilling operations it would be clamped off to steel spud piling passing through the barge and driven into the lake bottom.

This was a radical departure from any known type of drilling structure. The method of operation was feasible from the mechanical point of view because of the existing weather and water conditions. It was most desirable because the lake floor, as mentioned previously, would not allow setting a large surface on bottom without considerable expense for site preparation.

It was decided to build this spud-type drilling barge. The requirements for equipment, layout, and specifications to meet lake conditions were submitted to Friede & Goldman, naval architects and marine engineers, New Orleans, who proceeded with the design of the vessel.



THE MUD BARGE floats freely next to the drilling barge during drilling operations. All mud equipment, gas supply, and electric generator are kept on mud barge.

How it's made . . . The drilling slot, located aft, is 26 ft. 3 in. long and 8 ft. wide. The bow of the barge is raked and the stern is square. The hull is framed longitudinally and is subdivided into eight water-tight compartments by longitudinal and transverse bulkheads. The barge is held in drilling position by means of eight 14-in. o.d. steel spuds passing through spud wells located near the sides of the barge.

The barge is held in an operating position by drill-collar clamps around the piling and seating on suitable brackets built onto the barge. Sea valves permit selectively flooding any of the various compartments in order to level up or add weight as required. A 3-ton-capacity boom is located to the starboard side of the barge to facilitate transferring pipe and heavy supplies onto the drilling barge.

The barge was fabricated by B. A. Rothschild Boiler & Tank Works in its Shreveport shop. It was then cut in eight sections, the heaviest weighing around 18 tons, and transported by truck to the lake bank where the sections were then welded together by the contractor on the temporary launching ways and fabrication and painting completed. The barge was launched June 13, 1954. It was constructed at a cost

PILINGS UP. well completed, the barge is ready to be floated to a new location. In 6 hours a new well will be spudded.

of $58,000 which was paid out by the platform-cost savings on six wells.

The drilling contractor moved his standard equipment on the barge. A draw works powered by two gas engines and a 96-ft. high-speed mast were placed on a 9-ft. standard substructure. About 6,000 ft. of 4½-in. drill pipe is carried on the rack with enough room remaining for 6,000 ft. of 5½-in. casing.

Moving on Location

Before moving the barge on location, six creosote piles are driven and framed to fit the barge keyway. The lake bottom around the location is swept for stumps and cypress knees and those which might damage the marine equipment are removed. The drilling barge is towed to location and threaded over the keyway structure.

When the barge is in position the spud piles are unclamped and allowed to fall through the barge. They penetrate the lake bottom about 5 ft. The mud-tender barge is then brought along the port side and pinned to the drilling barge so as to allow it to rise and fall with the waves, independent of the drilling barge.

Gas connections are made to a line previously laid to the location and mud, water, light, and gas connections are made between the two barges. The well is usually spudded in less than 6 hours after leaving previous location.

As time permits, the spud piles are pushed farther into the lake bottom by means of a pair of shop-made hydraulic jacks. Brackets are on the barge deck, fore and aft of each spud location, so that the jacks can be slipped into position on each side of a pile. After each pile has been driven to a predetermined loading the jacks are moved to another pile for driving.

A hydraulic system is extended down both sides of the barge, the hydraulic pumps being located on the deck under the tool house. During drilling operations the barge is normally clamped off by a safety clamp on each spud pile. A small amount of water is added to each compartment in order that the piling will carry a positive load and, on the corner pile, a second clamp is used to prevent the barge's rising due to wave action.

Raising or lowering . . . It is necessary to raise or lower the barge when the lake level changes appreciably. A small lake variation can be adjusted by adding water to the compartments as the lake rises (to retain a positive force on the spud piling) or by removing water for lake fall (up to the amount in the barge when clamped off). When the barge is to be raised or lowered it must first be brought to equilibrium, unclamped, and raised or lowered before again being clamped off. Normal drilling operations are not disrupted during this adjustment of the barge.

After setting casing and while completing the well, the barges are prepared for movement to the next location. All but one or two of the spud piles are pulled by means of the hydraulic jacks. They are raised so that the lower end is above the bottom of the barge and are then clamped off. If the water should get rough, the piling could again be dropped in a very short time.

Mud connections between the two barges are severed when it is apparent that the well will be completed and the remaining spud piling pulled. The water, gas, and light connections are broken when the rig is released. The barges are then ready to be unpinned and moved to a new location. The drilling barge is towed to the new location with the mast raised.

After completing the well the six-pile keyway is decked over and completed to serve as walkaround and well protector. A removable steel upper platform is added to allow operations when the well is put on the hydraulic pump system after it ceases to flow.

Upon completion of the drilling program the drilling barge will be used as a work deck for servicing wells as required, and also for working over wells, if necessary.

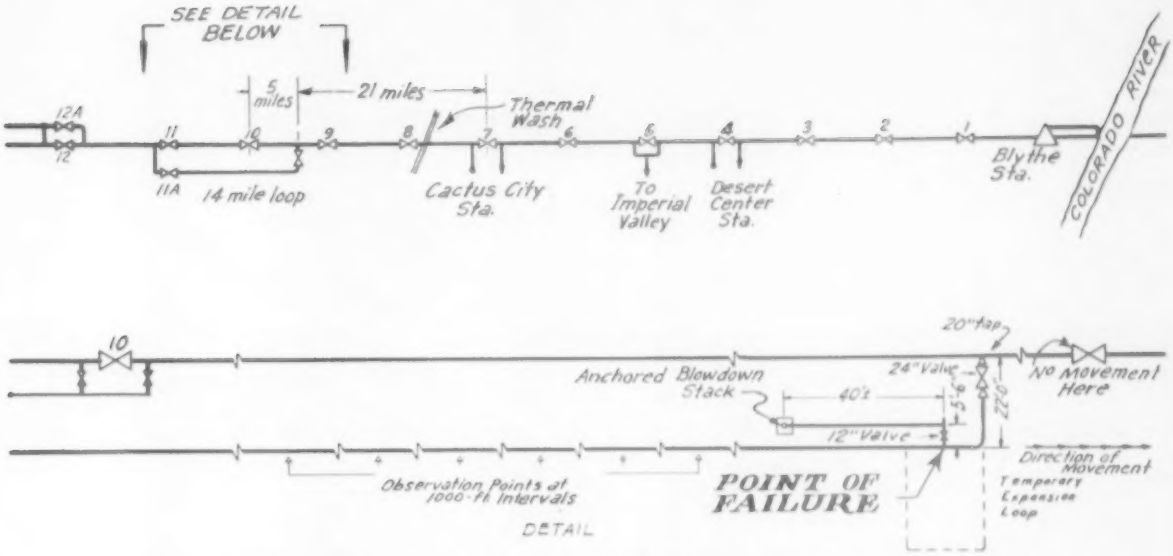
This spud-type drilling barge has proved very satisfactory for drilling operations on Caddo Lake. The time and effort, as well as expense of moving from one location to the next, have been reduced. A large saving has been effected by eliminating construction of costly drilling platforms.

Acknowledgment

Appreciation is expressed to the management of Gulf Refining Co. for permission to publish this paper and to J. C. Phillips and W. C. Best for their assistance in its preparation.

THE AUTHOR

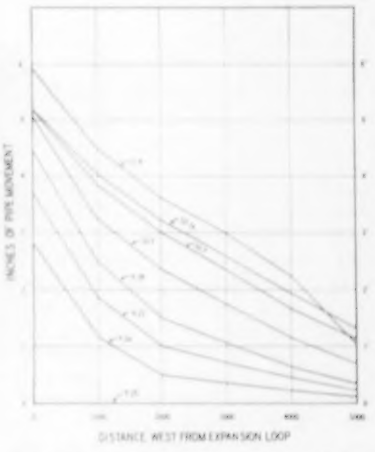
C. W. Chachere is equipment engineer at Shreveport for Gulf Refining Co., to which post he has been assigned for the past 5 years. He graduated from Texas A. & M. College in 1943 with a B.S. in electrical engineering. After a 4-year stint in the Armed Forces, he went to work for Gulf Oil Corp. in East Texas field. After East Texas, he worked in Smackover fie'd, Arkansas, during electrification of Gulf wells.



SCHEMATIC OF PIPELINE showing point of first failure which was caused by line movement. Fig. 1.

Line movement caused such damage as this

EXAMPLE OF COATING DAMAGE caused by pipe movement. Fig. 3.



AMOUNT of pipe movement recorded at five test points. Fig. 2.

. . . So special anchors were designed to

HOLD THAT PIPELINE!

by H. C. Vander Heyden and E. A. Wallace

Here is the case history of two big-inch gas-transmission lines that had to have special anchors to keep them from moving. Cause of movement was traced to increased operating pressures and temperatures which came with addition of two booster stations. This article describes studies made and corrective measures taken in suppressing the movement.

MAIN-LINE anchors have been installed on two 30-in. gas-transmission lines in the desert west of Blythe, Calif. Before the anchors were put in, line movement caused failure of one 12-in. connection. It also caused high stresses in overbends and sidebends along the main line and damaged some coating.

Increased gas temperatures and pressures were the cause of movement. These had been increased by the additions of two booster stations.

The lines involved are the California section of a 30-in. system bringing gas from Texas into the Los Angeles area. They are jointly owned by Southern Counties Gas Co. and Southern California Gas Co.

At first, only one 30-in. line was laid and compression for the gas was provided by a station at Blythe. Later, increased demand called for some looping and the addition of two compressor stations. Desert Center, the first booster, is 46 miles west of Blythe and the Cactus City booster is another 31 miles downstream.

Looping on the line was in three stages. The first was laying of 82 miles of 30-in., then loops of 14 and 6 miles

Paper presented at Pacific Coast Gas Association conference, Palm Springs, Calif., May 2-3, 1955. Authors are with Southern California Gas Co. and Southern Counties Gas Co., respectively.

of 30-in., and finally, laying of 73 miles of 30-in.

Under packed conditions, suction and discharge pressures at the compressor stations are: Blythe, 480 to 807 psig.; Desert Center, 710 to 807 psig.; and Cactus City, 651 to 725 psig.

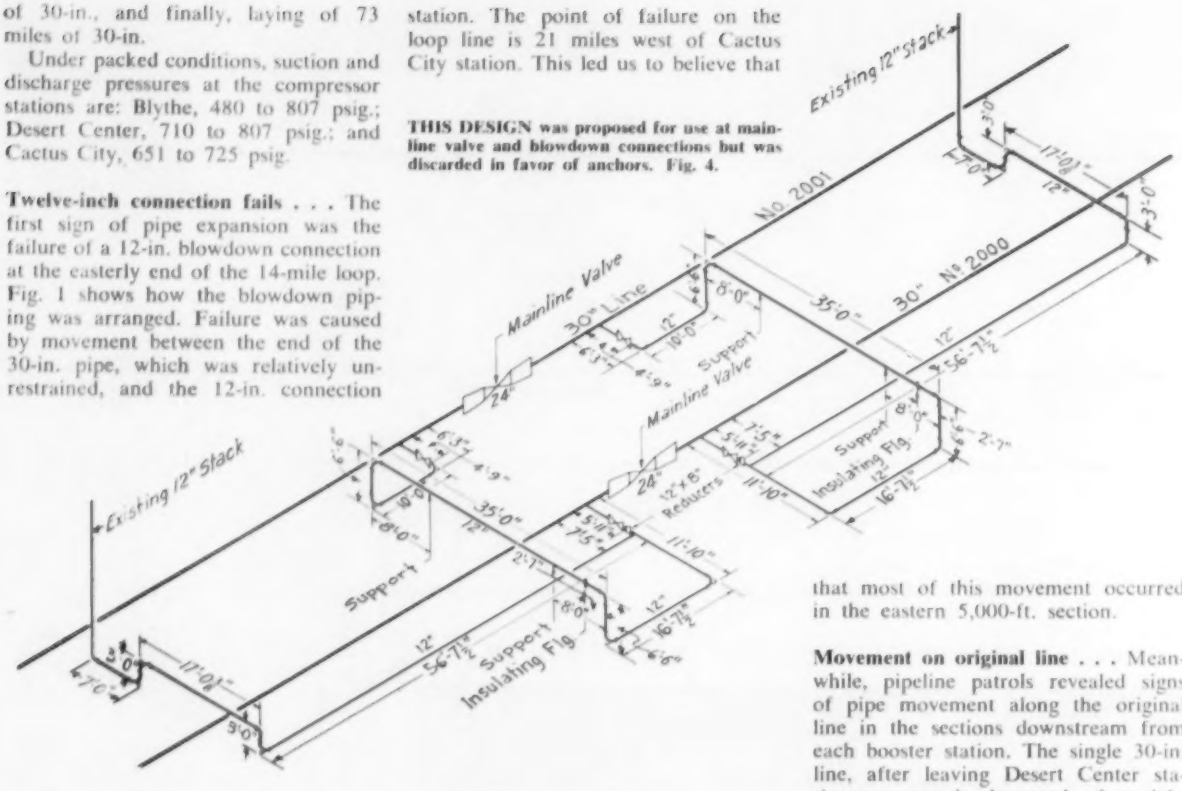
Twelve-inch connection fails . . . The first sign of pipe expansion was the failure of a 12-in. blowdown connection at the easterly end of the 14-mile loop. Fig. 1 shows how the blowdown piping was arranged. Failure was caused by movement between the end of the 30-in. pipe, which was relatively unrestrained, and the 12-in. connection which was anchored through the blowdown line to a concrete block. The failure extended around half the circumference of the 12-in. pipe at the edge of a fillet weld on a fabricated 30 by 12-in. tee and opened a maximum of 3/8 in.

The failure occurred a few days after the Cactus City booster station went into operation. With this station running, the pressure increased about 100 psi., and the temperature of the discharge gas increased as much as 40° F. above normal ground temperature. This rise in temperature was caused by both booster stations. Desert Center station was already in service and the gas lost only about half of the heat of compression by the time it reached Cactus City station. Gas cooling at the booster stations was not provided since not enough water was available.

With ground temperatures as high as 95° F., the added heat of compression was enough to cause the coating material to become plastic. This allowed the pipe to slip inside the wrapper, thus losing the benefit of the restraint from the earth.

Effects causing failure . . . Forces causing movement are believed to be due to both pressure and temperature effects but primarily to pressure. There was no significant movement in the original line beyond Thermal Wash, which is 6.8 miles west of Cactus City station. The point of failure on the loop line is 21 miles west of Cactus City station. This led us to believe that heat of compression in the gas at the loop tiein was not enough to cause much expansion. It contributed to the failure principally by softening the coating material which allowed the pipe to slip inside the wrapper and expand due to the internal pressure.

THIS DESIGN was proposed for use at mainline valve and blowdown connections but was discarded in favor of anchors. Fig. 4.



At first we were not aware of any movement in the original line. We were concerned only with expansion of the 14-mile loop. The pipeline was cut to remove the broken connection and relieve stress on the loop tiein. The tiein moved 1⅜ in. after the cut was made. The 12-in. connection was replaced but due to continued movement the blowdown tie was finally removed and a temporary expansion was installed to protect the main-line tiein.

The line still moved even when the Cactus City station was not in operation. But movement was accelerated when the station was running. Five reference points were established at 1,000-ft. intervals westerly from the point of failure. Fig. 2 shows the amount of movement measured at these points from September 25 to November 4.

The expansion loop was removed November 19 preparatory to extending the loop line eastward. From the time of the failure to the time the expansion loop was removed, the east end of the parallel line had moved 13 in. From the amount of movement recorded at each of the reference points it appears that most of this movement occurred in the eastern 5,000-ft. section.

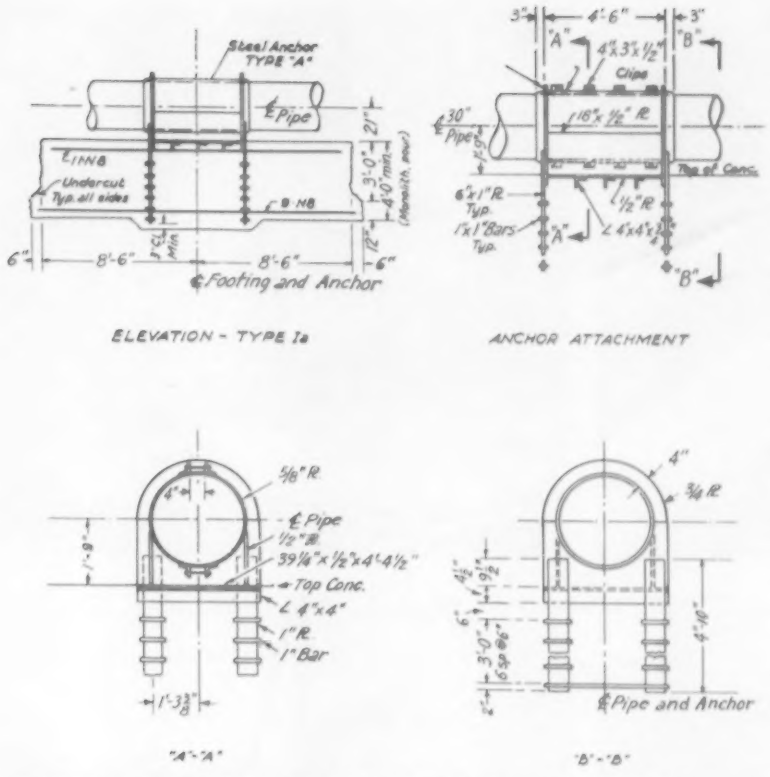
Movement on original line . . . Meanwhile, pipeline patrols revealed signs of pipe movement along the original line in the sections downstream from each booster station. The single 30-in. line, after leaving Desert Center station, runs west in almost a level, straight line for a distance of 2.6 miles. Then it crosses a highway on a 40° angle in 36-in. casing.

The ground over the two 40° weld elbows at each end of this crossing showed cracking and disturbance. When excavated, it was found that movement to the west on the south leg from the station had split the pipe coating.

This offset had acted as an expansion loop, stressing the pipe and the 40° weld ells. This offset is 335 ft. long and the casing is approximately 90 ft. long. This provided for free movement of the pipe in the center section of the offset.

About 5.5 miles west from this crossing is an important 8-in. takeoff line serving the entire Imperial Valley. This takeoff is at a sectionalizing valve with two blowdown valves located in an open-top manhole. The line from the highway crossing to this takeoff is in a level straight run and no movement was detected at this vault nor west of this point to the Cactus City booster station.

The 30-in. line leaving Cactus City station has many horizontal and vertical offsets and some open spans. Evidence of movement was noted at 14 locations between Cactus City station and the loop tiein. These locations were where the pipeline changed direction either vertically or horizontally by means of ell segments or wrinkle bends. Surface indications varied from hair-



DETAILS of final anchor design, Type 1-A, for the 30-in. line. Anchor block dimensions are as follows: Type 1-A, 17 ft. long by 10 ft. wide by 4¾ ft. deep. Type 1-B, 22 ft. long by 14 ft. wide by 5¼ ft. deep. Fig. 5.

line cracks above the angle points to one location where the pipe had raised 5 to 6 in. at the end of the span.

The pipe coating at the open spans had been peeled back in each location where the pipe enters the ground to the west. Coating at the angle point fittings had been damaged in a similar manner as that on the highway crossing described above.

It was significant that no signs of movement were noted at the valve vaults since the blowdown connections would have been subjected to severe bending stress if movement in the vaults had occurred.

Pipe Coating

The first look at pipe coating in the areas of movement revealed what appeared to be extensive damage to the outer wrapper. It seemed that 20 or 30 miles of pipe would have to be reconditioned. Tests, however, show that in general, the coating is still effective. We have not had to apply any special protection with the exception of repairing the coating at angle points and exposed spans where damage was severe.

Fig. 3 shows a short section of exposed pipe and the damage resulting where part of the coating was restrained by the earth and part of it was free to move.

Pipe for both lines was yard-coated with a single coating consisting of a primer, a layer of enamel averaging 3/32 in. thick and one wrap of 15-lb. asbestos felt. The physical characteristics of the enamel on the two lines are not the same. But since the conditions where slipping occurred were different, no evaluation can be made as to which coating had more resistance to movement. The coating on both lines undoubtedly is damaged but it may be several years before the extent of damage is known.

Was the Line Structurally Sound?

After the failure of the blowdown tap, we continued our observations. With ground temperatures decreasing there was less concern.

Plans were in progress to install 73 miles of parallel 30-in. line easterly from the 14-mile section, part of which would be in the hot zone west of Cactus City. So the solution of the expansion problem was postponed until the new construction was completed.

However, with the new problem of thermal expansion there was a growing anxiety about the structural reliability of the entire 30-in. line. We were in need of expert advice so we presented our problem to Stone & Webster Engineering Corp. for its study and recommendations.

Expansion loops . . . Normally when providing for expansion or contraction in a pipeline you are led to expansion loops. This has been standard practice in treating high-temperature pipelines for years. Therefore, Stone & Webster and ourselves first considered using expansion loops at the crossconnections with sufficient anchors at critical offsets to force the movement of the line into the loops.

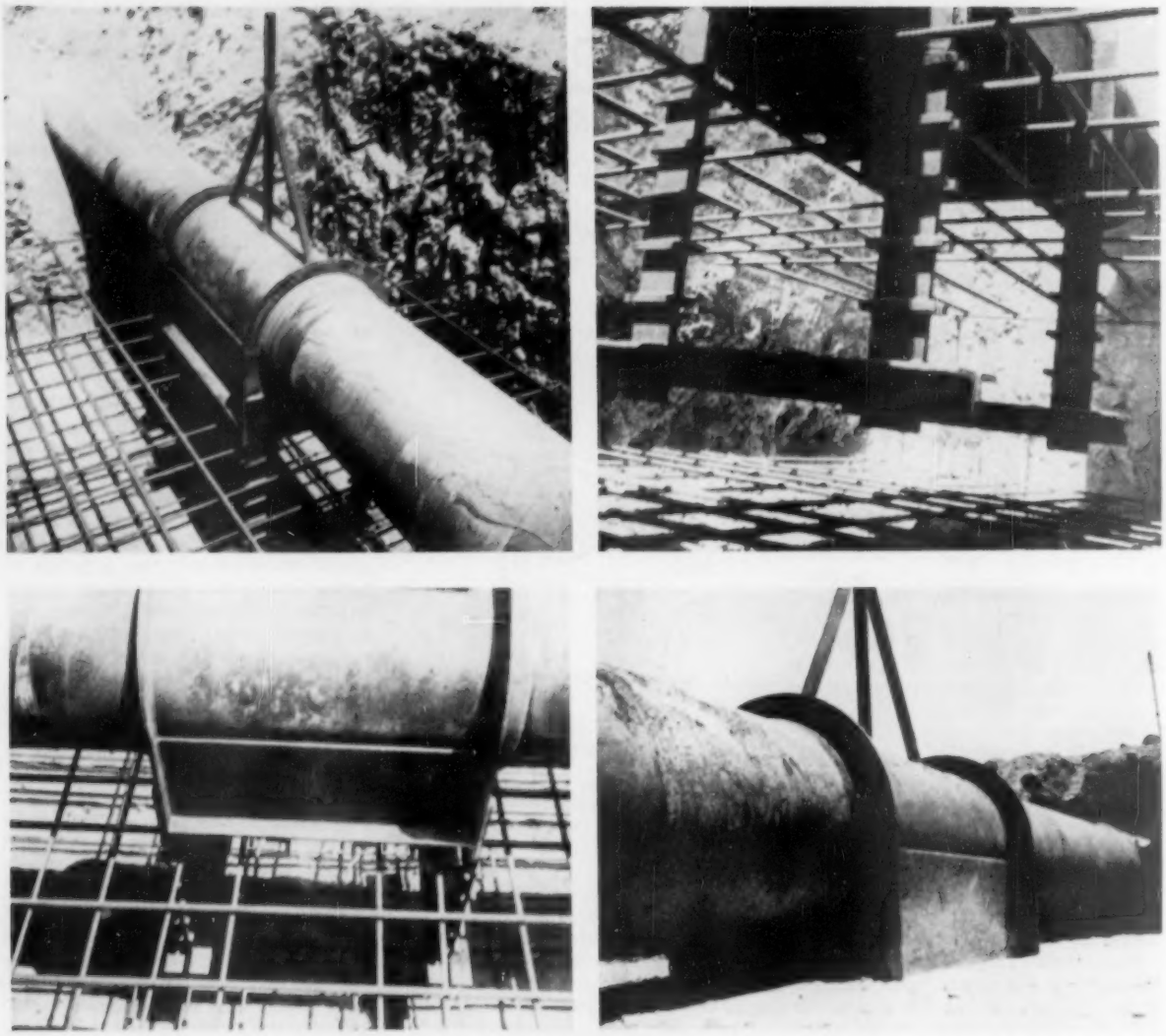
A preliminary design showing the use of expansion loops at a typical mainline valve and blowdown connection is shown in Fig. 4. The design allowed for a relative movement between the two 30-in. lines as well as movement between the main lines and the anchored blowdown stacks. The two 30-in. lines would not necessarily be expected to have a corresponding movement even if installed at the same time. So unequal movements were anticipated in these two lines, particularly since the original line was laid in the summer and the parallel line was laid in the winter months.

After the 73-mile loop line was in service, there were indications of movement in the hot zone west of Cactus City station of the same nature and at similar locations as along the original line. It seemed the parallel line was moving about the same as the original line but of course this nearly equal movement could not be depended on in designing the expansion loops. Further study showed that expansion loops were not the ideal solution to our problem. The loops would have had to be large enough to take care of any predictable amount of movement. This would have meant placing them aboveground, at the mercy of desert marksmen or other forms of sabotage. Aboveground, they would have required fencing and this would have raised costs. The casing necessary to give freedom of movement if they were put belowground would make costs prohibitive. Also, right-of-way was a problem in some places.

Therefore, it was agreed that Stone & Webster should consider using anchor blocks to restrain the lines. We agreed to accept the anchors if they were recommended. But we were still concerned about the effect of this type restraint on the cold wrinkles in the original line.

Anchors recommended . . . Stone & Webster submitted a report which, in general, was as follows:

1. A continuous straight pipeline laid underground in a reasonably level ter-



TYPE 1-B ANCHOR, showing top, bottom, and side views. Completed anchor is in lower right. Vertical pipe on top of anchor is target for transit shots to determine extent of movement. Fig. 6.

rain is self-restrained. It has little movement even when subjected to considerable temperature change and the coating is softened by the high temperatures. The major movement occurs in hilly terrain where vertical and horizontal bends and open spans of pipe prevent suitable self-restraint.

Protection of the 30-in. lines could be limited to that section between Desert Center station and Valves 8-8A, with special attention to the portion between Cactus City station and Valves 8-8A.

2. The increases in length due to internal pressure and to thermal expansion are of a progressive nature and would be difficult to predict. Expansion loops might be only a temporary remedy for this condition and rigid anchors appear to offer a more satisfactory solution.

The type of restraint offered by anchor blocks should not create stresses in the wrinkle bends materially different from those created by the normal restraint. The one wrinkle bend that failed in another part of the line apparently failed in tension. But the forces introduced by the higher gas temperatures will produce compression of the pipe.

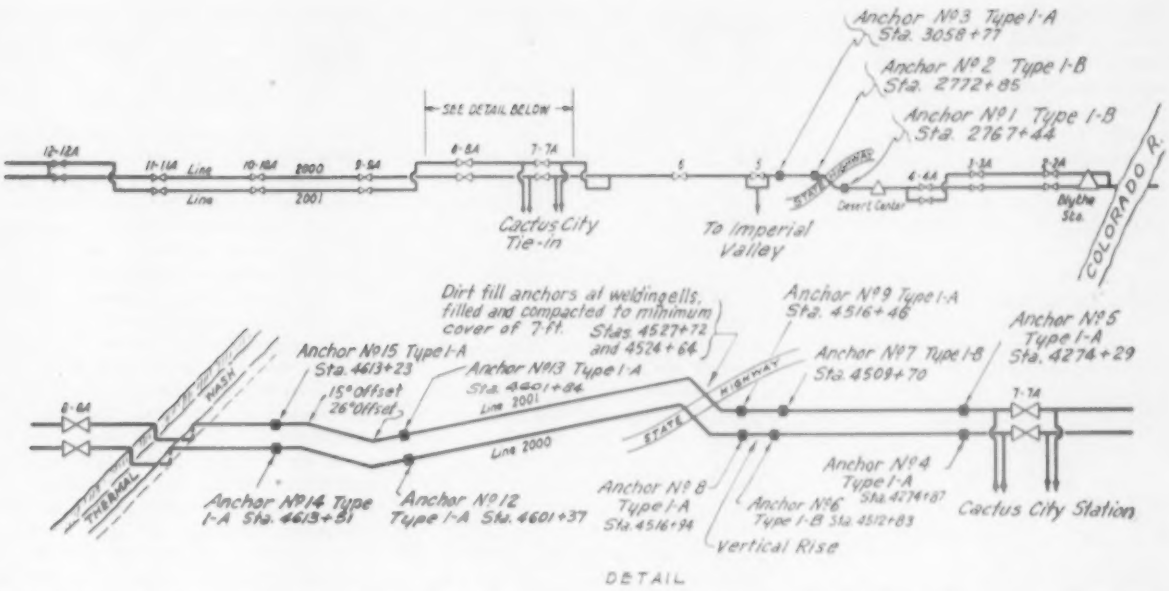
However, as a precautionary measure the wrinkle bends within 1,300 ft. of either side of the anchor should be sleeve-reinforced. After a further study of field conditions this was reduced to about 500 ft.

3. Supports should be provided at each exposed span in the distance between Desert Center booster station and Valve 8-8A to limit the total span to 75 ft. This is necessary to make the exposed pipe act as a column when in compression. The maximum unsupported span was 130 ft. on the original line and 100 ft. on the parallel line.

4. Further stress analysis to evaluate probability of failures would be time consuming and costly. Placing anchors where trouble existed or might be anticipated offers the only economically sound solution to the movement problem. Possible need for additional structural modifications should be determined by establishing a number of observation points where future pipe movement can be measured.

Designing the Anchors

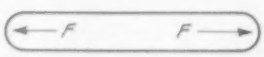
The design of the anchors depended upon forces involved, soil conditions, method of attachment to the pipeline, suitability of materials, and cost. An analysis of the forces acting on a pipeline is rather elementary but is interesting and will serve to show the basis of determining the anchorages required.



SKETCH showing points where anchors were installed and type of anchor used. Blowup shows critical section west of Cactus City station. Fig. 7.

Pressure Effects

1. Assume pipe with free ends, capped and unrestrained.



If pressure is applied internally, longitudinal tensile stress is set up in pipe wall.

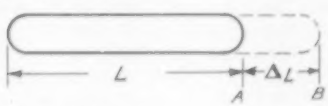
The force at the ends, F = total area × pressure.

For 30-in. o.d. by ⅜-in. wall pipe and 800 psi. internal pressure, F = 707 × 800 = 565,000 lb.

$$\text{Stress} = \frac{\text{Force}}{\text{Metal area}} = \frac{565{,}000}{29.1}$$

$$= 19{,}450 \text{ psi.}$$

2. This stress causes elongation in pipe from A to B.



Unit elongation:

$$e = \frac{\text{Stress}}{\text{Modulus of elasticity}} = S/E$$

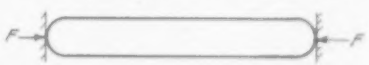
$$e = \frac{19{,}450}{30 \times 10^6} = 0.00065 \text{ in. per in.}$$

Total elongation, ΔL = e × L, length:

For 1,000 ft., ΔL = 7.8 in. and for 10 miles, ΔL = 28.5 ft.

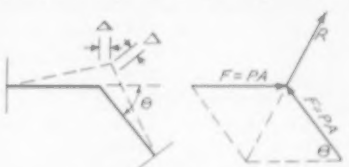
3. Since an actual pipeline does not move nearly this much it may be considered restrained.

If completely restrained by anchors,



displacement, ΔL, cannot take place. The entire force, F, is transferred to reactions and **there is no longitudinal stress due to internal pressure.**

4. For pipe with an angle Θ, unrestrained except at ends, displacement,



Δ, occurs in directions shown, and longitudinal forces and stress of (1) above applies.

The resultant R = 2 PA sin Θ/2.

$$R = 2 \times 565{,}000 \sin \Theta/2$$

$$= 1{,}131{,}200 \sin \Theta/2$$

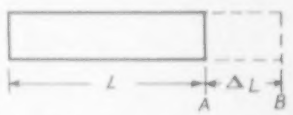
For Θ = 22½°, R = 240,000 lb. due to internal pressure only.

This large resultant force R causes movement in the direction shown, which if unrestrained will be resisted only by tensile stress of the pipeline.

To prevent movement and stress, an equal and opposite anchor force must be supplied.

Temperature Effects

5. Assume open end pipe (no internal pressure) subject to temperature change.



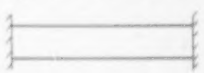
If heat is applied, pipe elongates from A to B at rate of 6.5 × 10^{-6} in. per inch per °F. rise. If the pipe is unrestrained and elongation occurs, **no stress is present in the pipe wall due to temperature change.**

For a 50° F. rise, elongation would be 32.5 × 10^{-5} in. per inch.

Total elongation ΔL = unit elongation × length.

For 100 ft., ΔL = 0.39 in., for 5,280 ft., ΔL = 20.6 in.

6. If pipe is fully restrained and heated, displacement, ΔL, cannot take



place and longitudinal compressive stress, S, appears in pipe wall.

S = 6.5 × 10^{-6} modulus of elasticity × temperature rise.

S = 6.5 × 10^{-6} × 30 × 10^6 × T = 195T.

This stress results in a force, F, required to resist expansion:

F = metal area × stress = 5,670 × T

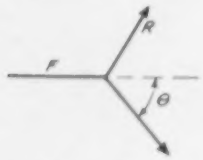
For various temperature rises, the stress and forces are as follows:

Temp. rise, T (°F.)	Stress, S (psi.)	Force, F (lb.)
10	1,950	56,700
20	3,900	113,400
50	9,750	283,500

For straight pipe, anchor forces re-

quired to resist movement due to temperature changes are tabulated above. They are independent of length or total movement being restrained. Since an actual pipeline does not move any amount approaching elongations due to temperature, it may be considered restrained, as in (2) above. But if restrained, **the above stresses appear as compression in pipe column.** Restraint, therefore, eliminates tensile stress due to pressure, but produces compressive stress due to temperature rise.

7. For pipe bends, resultant force R, due to temperature, may be developed similar to (4) above.



where $R = 2F \sin \theta/2$.

For a 50° F. rise, F = 283,500 lb. from (6) above and resultant force R for various angles is:

$$R = 567{,}000 \times \sin \theta/2$$

For $\theta = 22\frac{1}{2}°$, R = 120,000 lb.

For $\theta = 45°$, R = 217,500 lb.

For $\theta = 90°$, R = 402,000 lb.

due to temperature alone.

To prevent movement, an equal and opposite anchor force must be supplied.

Combined Effects

8. The forces due to pressure and temperature are additive. Hence resultant anchor force for immobility of the bend is the sum of the individual forces tabulated under (4) and (7) above. For a line with pressure of 800 psig. and a temperature rise of 50° F. the anchor force for $\theta = 22\frac{1}{2}°$, R = 360,000 lb.; for $\theta = 45°$, R = 651,000 lb. due to both pressure and temperature.

Straight-line anchors are, therefore, designed for temperature effect only. Anchors at bends are designed for both pressure and temperature effects.

Selecting the Final Designs

Originally three types of anchor blocks were considered: one for a straight-line location, one for vertical angles, and one for horizontal angles. Each had an alternate design whereby the resistance clamp welded to the pipe could be either totally embedded in the concrete block or exposed and secured to the concrete block by structural attachments. The designs with the pipe embedded in the blocks were discarded since we wished to avoid elaborate corrosion protection seals between the concrete and pipe. Also, it was desirable to allow for complete access to the pipe. Lowering the blocks below the pipe gave higher soil bearing pressures at greater depths and reduced the concrete required.

Every effort was made to simplify the design to reduce the cost of installation. Straight rectangular shapes were used to allow for pouring undisturbed soil without forms, thus giving maximum undisturbed earth restraint. At side bends straight-line-type anchors were designed for both pressure and temperature restraints. These were located on the straight section of pipeline close to the bend.

Thus only two designs were finally used and they differed only in the dimensions of the anchor block and the amount of reinforcing steel required. The Type 1-A anchor shown in Fig. 5 was designed to restrain temperature forces only. The Type 1-B anchor was designed to restrain both pressure and temperature forces.

Several photographs of a Type 1-B anchor are shown in Fig. 6. The reinforcing steel placed perpendicular to the centerline of the pipeline as shown in the photographs was not included in the design of the Type 1-A anchor.

Welding the anchor . . . The method of attaching the anchor to the pipe posed a problem since the pipe material is cold worked to obtain its high yield strength. Welding directly on the pipe would anneal the steel plate and reduce the yield strength. The pipeline was designed with an allowable hoop stress of 35,000 psi. in the desert sections which is about the maximum for pipe with a 52,000-psi. minimum yield; therefore, a longitudinal weld on the pipe was not advisable.

Since the lowest stress in the pipe wall is in the direction parallel to the centerline, long circumferential saddles were used. All welding to the pipe was in a plane perpendicular to its centerline.

The thrust is thus transmitted from the pipeline to the saddle by circumferential welds at both ends of the saddle, and from the saddle to the concrete block by circumferential end plates and two longitudinal stiffening plates. The saddles were keyed to the concrete by angles to take shear. The long straps and bars provided at each end were designed to resist overturning due to the eccentricity of the applied load.

Concrete was chosen for anchor blocks rather than batter piles because of its availability in the remote areas required, its resistance to corrosion, the desired mass and friction inherent in this type of structure, and the relative simplicity and low cost of installation. Anchor thrust considered was the passive pressure on the ends of the concrete block, plus the frictional resistance against sliding on the bottom.

Installing the Anchors

It was planned to anchor the lines while pipe temperatures were midway between the extremes of summer and winter operations. This would minimize stresses induced in the pipe by these temperature extremes. With the anchors, 73 wrinkle bends were to be reinforced and a miscellaneous number of A-frames installed.

The general location for each anchor was shown in the Stone & Webster design, but the exact location had to be determined in the field based on the following:

1. Anchors must be located so as to have undisturbed soil for a minimum distance of 60 ft. either side of anchor centerline (not near an open span).

2. Depth from ground surface to bottom of anchor block must not be less than 9½ ft. for Type 1-A and 11 ft. for Type 1-B. With less cover the size of the anchor block would be increased.

3. Steel anchor attachment must not be made at a wrinkle bend.

The final locations are as shown in Fig. 7. At the road crossing west of Desert Center a Type 1-B anchor was installed about 100 ft. east of the south ell and 100 ft. west of the north ell. At Valve 5, the Imperial Valley tap, a Type 1-A anchor was recommended to safeguard this important takeoff.

Since no excessive movement had occurred at the north turn of the highway crossing west of Cactus City station, no anchor was included at this location. But special attention was given to the compaction of the backfill at both the north and south angle points of highway crossing.

At the 26° horizontal bend, about 7,000 ft. west of the highway crossing, movement to the west had occurred in the original line so anchors were located just east of these angle points and west of the 15° horizontal angles to protect this offset from both directions. The 721 ft. of concrete encased heavy wall pipe in the bottom of Thermal Wash served as an effective anchor to the west. Since no significant movement of the original line had occurred at Valve 8 or west of this valve, no anchors were considered necessary on either line west of this point.

How anchors were installed . . . The general procedure followed for installing the anchors was as follows:

1. Excavate for installing the sleeve and clean the pipe.

2. Clamp on sleeve and complete longitudinal weld. Remove bolts and clips.

3. Make final excavation for anchor block.

4. Install box assemblies and complete welding. (By scheduling the time for the circumferential welds on the pipe, pressure cutbacks were held to a minimum. For pipe designed for 807-psig. working pressure the pressure for welding is 565 psig. For a 725-psig. design the welding pressure is 510 psig.)

5. Install reinforcing steel in block.

6. Install bench mark and riser on anchor sleeve for reference.

7. Pour concrete.

8. Tar and wrap pipe and sleeve.

9. Backfill, cleanup, and install markers for gaging possible future longitudinal movement.

The Stone & Webster recommendations were as follows: For 36 hours before and 48 hours following pouring of concrete, line temperature at anchor location should be maintained as near 95° F. as possible. Pressure to be maintained within ±10 psi. for first 10 hours after pouring and ±25 psi. of a constant for a minimum of 36 hours. Line pressure not to exceed 550 psi. for 48 hours following the installation.

Construction was started about the first of June and nearly all the welding and concrete work was completed by the first week in July. The entire job including the installation of the wrinkle bend reinforcements was finished by the end of July. The total cost of the project amounted to $98,614 with the following breakdown:

Anchor blocks	$60,436
Type 1-A, average $3,984	
Type 1-B, average $5,753	
Bending wrinkle bends	23,775
Average per bend $325	
Installation of A frames	14,403
Total	$98,614

Conclusion

Before each concrete block was poured, elevations of the pipe riser and bench mark were taken. After the block was poured and at intervals since then, elevations have been taken to determine if the anchor blocks have settled or otherwise moved. No such movement has taken place.

We now have gone through a cycle of summer and winter temperatures without trouble since the anchors were installed. During the past summer we did not experience the maximum temperatures we can expect since either one or the other turbine stations was out of service most of the summer. But indications are that the method of anchoring, the design of the anchor blocks and clamping attachments, and location of the anchors, as recommended and designed by Stone & Webster, have been entirely satisfactory.

How Oil Pipeline Companies Fared in First Quarter

(From the quarterly reports of pipeline companies to the Interstate Commerce Commission)

Company—	Transportation revenues 1955	Transportation revenues 1954	Per cent increase	No. of bbl. of oil originated on line and received from connections 1955	No. of bbl. of oil originated on line and received from connections 1954
Arapahoe Pipe Line Co.	$927,795			6,869,253	
Arkansas Pipe Line Corp.	555,323	$476,373	16.6	3,305,693	3,052,159
Atlantic Pipe Line Co.	2,340,393	2,077,951	12.6	17,173,973	16,636,982
Badger Pipe Line Co.†	86,819			1,262,378	
Bradford Transit Co.‡	167,706	147,192	13.9	1,142,425	1,355,357
Buckeye Pipe Line Co.	4,123,970	3,697,747	11.5	49,596,860	49,038,267
Buffalo Pipe Line Corp.*	224,211	158,356	41.6	3,254,072	2,573,707
Cherokee Pipe Line Co.	1,025,229			6,631,270	
Cities Service Pipe Line Co.	1,553,504	1,795,131	—13.5	19,848,394	21,267,777
Continental Pipe Line Co.‡	1,634,135	1,315,006	24.3	18,495,209	15,497,119
Cooperative Refinery Assn.	266,512	270,677	—1.5	2,421,139	2,307,719
Crown-Rancho Pipe Line Corp.	184,558	185,326	—0.4	1,079,368	1,051,291
Eureka Pipe Line Co.	261,540	306,493	—14.7	670,725	1,287,539
Freedom-Valvoline Oil Co.	73,427	37,487	95.9	965,893	588,214
General Amer. Pipe Line Co.†	95,972	83,678	14.7	1,691,845	1,570,213
Great Lakes Pipe Line Co.*	9,087,417	9,014,870	0.8	20,757,236	19,829,260
Gulf Refining Co.	8,587,926	7,899,544	8.7	75,608,674	65,907,848
Humble Pipe Line Co.	9,391,888	8,590,439	9.3	67,668,572	61,218,666
Illinois Pipe Line Co. of Texas	202,463	198,541	2.0	2,708,783	2,723,576
Interstate Oil Pipe Line Co.	4,585,657	5,089,669	—9.9	36,394,286	42,962,341
Kaneb Pipe Line Co.*	216,360	68,272	216.9	1,586,352	1,187,663
Kaw Pipe Line Co.	716,760	719,568	—0.4	11,029,591	10,946,084
Keystone Pipe Line Co.*	1,242,055	994,862	24.8	10,202,747	8,520,182
Lakehead Pipe Line Co., Inc.	2,843,396	2,746,488	3.5	10,244,879	7,589,178
Magnolia Pipe Line Co.	9,085,251	8,096,218	12.2	43,412,535	39,747,494
Michigan-Ohio Pipeline Corp.‡	239,509	233,099	2.7	3,409,225	3,080,829
Mid-Valley Pipe Line Co.	3,660,288	4,093,322	—10.6	15,558,220	15,314,717
Nantucket Pipe Line Co.	166,643	107,307	55.3	1,149,423	987,098
National Transit Co.	456,958	441,576	3.5	3,387,874	4,724,337
New York Transit Co., Inc.†	180,397	150,638	19.8	4,930,800	4,515,294
Northern Pipe Line Co.	188,020	174,064	8.0	5,130,404	4,924,362
Ohio Oil Co., Pipe Line Dept.	3,572,217	3,556,398	0.4	42,679,708	41,578,021
Okla., Miss. River Prod. Line, Inc.	876,341	199,429		3,989,883	2,077,674
Pan American Pipe Line Co.‡	2,255,470	1,759,232	28.2	17,425,022	14,176,420
Phillips Petroleum Co.*	508,193	384,425	32.2	866,846	663,905
Phillips Pipe Line Co.	7,057,631	6,044,834	16.8	31,338,335	27,318,048
Pioneer Pipe Line Co.	312,768	339,206	—7.8	763,913	848,630
Plains Pipe Line Co.	330,077	387,247	—14.8	3,099,880	3,334,065
Plantation Pipe Line Co.*‡	6,777,151	5,904,855	14.8	21,414,351	19,162,629
Platte Pipe Line Co.	2,758,190	2,829,430	—2.5	12,141,149	11,115,743
Portland Pipe Line Corp.	1,277,034	1,151,505	10.9	16,361,869	14,644,754
Project Five Pipe Line Corp.*	261,875	306,625	—14.6	3,569,118	3,467,173
Pure Transportation Co.	1,295,547	1,237,473	4.7	18,892,197	14,801,055
Salt Lake Pipe Line Co.	2,294,971	2,539,921	—9.6	7,345,896	7,554,180
Service Pipe Line Co.	14,127,479	13,447,272	5.1	46,601,115	42,058,884
Shamrock Oil & Gas Corp.*†	201,414	160,366	25.6	428,520	318,824
Shell Pipe Line Corp.	8,177,391	7,739,704	5.7	37,793,346	34,593,671
Sinclair Pipe Line Co.	10,894,686	10,264,314	6.1	57,005,103	45,850,912
Central Pipe Line Division	183,595	173,041	6.1	3,739,947	3,438,900
Sohio Pipe Line Co.*	1,496,610	1,518,570	—1.4	15,020,123	14,008,640
Southeastern Pipe Line Co.*	767,357	772,390	—0.7	3,290,765	3,320,834
Sun Pipe Line Co.	3,491,964	2,948,031	18.5	26,522,780	24,353,819
Texaco-Cities Service P. L. Co.§	2,426,622	2,383,371	1.8	21,520,695	20,254,701
Texas-N. M. Pipe Line Co.‡	2,495,466	2,130,588	17.1	26,570,799	24,130,481
Texas Pipe Line Co.‡	8,513,168	7,947,840	7.1	61,015,794	52,682,598
Tidal Pipe Line Co.	195,078	239,836	—18.7	3,264,534	3,894,175
Tide-Water Pipe Co., Ltd.		45,323			369,023
Toronto Pipe Line Co.	490,538	457,826	7.1	6,495,828	6,216,741
Triangle Pipeline Co.*	827,163	662,901	24.8	6,537,195	4,996,687
Tuscarora Pipe Line Co., Ltd.*	371,991	388,679	—4.3	1,962,636	2,456,370
Utah Oil Refining Co.	757,298	715,716	5.8	5,175,422	4,922,103
West Texas Gulf Pipe Line Co.	1,779,474	2,057,860	—13.5	29,367,048	27,768,647
Wolverine Pipe Line Co.*	710,309	453,547	56.6	3,492,964	2,066,175
Wyco Pipe Line Co.*	385,999	398,155	—3.1	1,166,629	1,217,961
Wyoming-Nebraska P. L. Co.	99,799			309,222	
Yellowstone Pipe Line Co.	438,947	2,270		1,060,007	227,045
Total	$152,781,895	$140,718,074	8.6	985,816,737	890,294,761

*Company engaged primarily in handling refined petroleum. †Commenced filing as of first quarter, 1955. ‡Number of barrels of oil is total delivered out of system. §Formerly Texas-Empire Pipe Line Co.

The bit has outlined several oil fields in southern Oklahoma where production occurs below thrust or reverse faults. And more important, these fields lie along trends which may offer many more fields than those already discovered. This article outlines the geologic data behind this theory and tells . . .

Fig. 1—Production occurs below thrust faults in several fields along the flanks of major uplifts.

Why Subthrust Production Is Promising

by Norman S. Morrisey* and Jack L. Walper†

DRILLING through thrust or reverse faults is uncovering sizable reserves in southern Oklahoma. Similar traps occur in California, the Rocky Mountains, and Canada.

Oil companies are gaining valuable data by studying fields like Eola and the Gotebo area in Oklahoma. Production occurs on the downthrown side of known fault trends; the oil is trapped against a reverse or thrust fault (Fig. 1).

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Editor's note: Subthrust production refers to production below a reverse or thrust fault.

Thrusting often is accompanied by large horizontal movements and intense deformation. But subsurface control in some fields in Oklahoma shows that thrusting or reverse faulting can occur with relatively little deformation of competent beds. Since the fault planes may be nearly vertical, such faulting can only be inferred where well control is sparse.

Eola Field

Eola field, discovered in 1947, in southern Garvin County, Oklahoma, is a large complex structure with at least 3,000 ft. of relief. Oddly enough, mapping of Eola by seismic surveys is exceedingly difficult if not impossible in spite of its tremendous size. The present producing area is 3 miles long by 1½ miles wide, trending in a northwest-southeast direction; nearly 60 wells have been completed in the field.

Regionally, Eola lies between the Pauls Valley uplift on the north and Robberson pool on the south (Fig. 2).

The "anticline," if such a complex structure can be so designated, has a steep southwest flank with dips of 60°-70°. The central horst consists of a ramp of northeast dipping beds inclined at 30°-45°.

The north flank is a broad anticlinal nose and is separated from the central block by a reverse fault with 800-1,400 ft. of throw (Figs. 2 and 3). There appears to be 1,000 ft. of closure against the fault, although only about 500 ft. of this is productive to date.

Reservoir performance indicated the presence of the fault between the north flank and the horst. Wells have confirmed the fault, because they have drilled repeated sections. One well repeated the complete Viola section. (Fig. 4). Locally, the steep dip in the Sylvan shale may be caused by compressing the incompetent Sylvan shale with subsequent flow of this shale rather than by additional faulting.

The main faults that control production at Eola have relatively steep dip. Well control indicates that the northerly fault may be nearly vertical. The fault that separates the steeply dipping southwest flank from the central horst appears to be a zone rather than a single fault since several wells along this zone

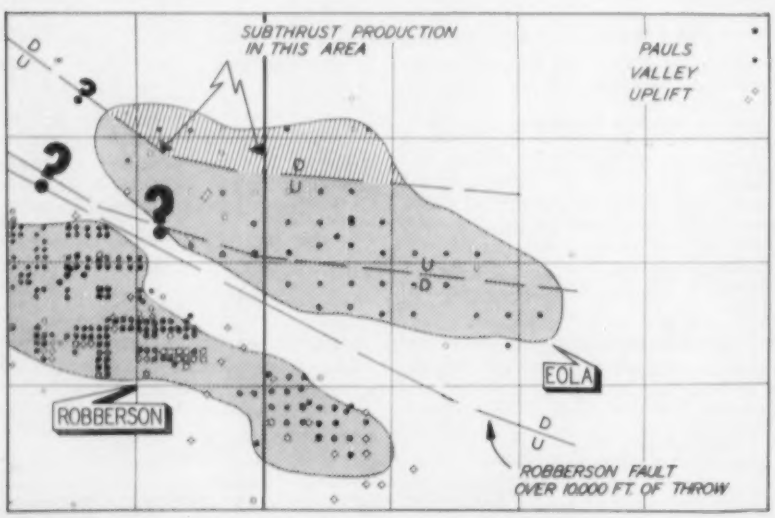


Fig. 2—Simplified fault pattern in the Eola area. In the Robberson pool the top of the granite is above 5,000 ft. subsea; at Eola this top is estimated at below 15,000 ft. subsea. (Base map courtesy of D. B. Rhea, Oklahoma City.)

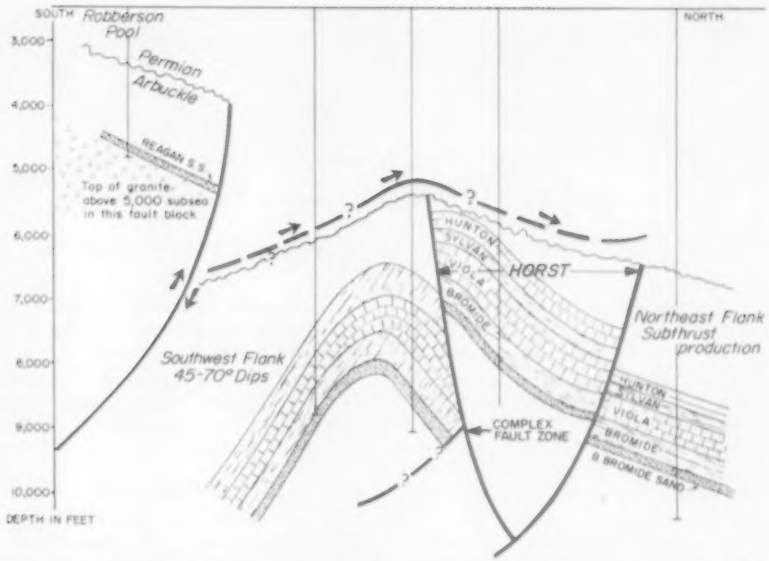


Fig. 3—Eola has over 3,000 ft. of relief; on the northeast flank oil is trapped against a reverse fault that has between 800 and 1,400 ft. of throw.

have cut faults. Reservoir data indicate that some of these wells may even be in a separate fault block instead of faulting in the southwest flank or the central horst.

Upper fault zones . . . Few if any of the 50-odd wells at Eola have drilled a normal stratigraphic section. Below the limestone conglomerates (Pontotoc?) is a series of beds ranging from Simpson to Springer; correlations in this interval are extremely difficult from well to well. Two explanations are used to account for these abnormalities:

1. These beds represent landslides and slump from the Robberson overthrust that towered more than 10,000 ft. above the Eola structure during late Pennsylvanian time.

2. These beds are fault slivers or klippen—erosional remnants of a later period of faulting.

Geologists have sound arguments to support either theory. The second theory appears more probable based upon the preservation of Springer shale in certain wells in the horst and the knife-edge contact between these beds and the pre-Pennsylvanian formations.

Most wells encounter a fairly normal stratigraphic section below the Hunton limestone, unless the location is near one of the major fault zones. Many of the abnormalities and the faulting above the Hunton in most wells appear to be of shallow origin since they do not cut the lower beds. Steep dip complicates electric-log correlation; the work is simplified by comparing wells along strike rather than by using north-south offsets.

Structural history . . . The development of Eola occurred over a long period of time during at least two phases of Pennsylvanian uplift, the older Wapanucka (mid-Dornick Hills) and the younger Arbuckle (post-Hoxbar) orogenies.

Eola began as a simple anticline during the mid-Dornick Hills uplift of Pennsylvanian times. Continued growth formed a sharply folded and possibly faulted anticline; later erosion apparently cut into the Viola on the crest of the anticline.

The Arbuckle (post-Hoxbar) orogeny brought about the final development of the Robberson-Eola complex with uplift, faulting, and erosion. Robberson, only 1½ miles south of Eola towered above the latter and became the dominant structural feature. Robberson is the northwest extension of the Arbuckle Mountains; it is separated from Eola by a major fault with more than 10,000 ft. of throw. (Fig. 3).

During the Arbuckle orogeny, several flat-lying thrust sheets may have covered Eola; evidence of these was largely obliterated by the rapid erosion and the deposition of Pontotoc (?) conglomerates in front of the Arbuckle-Robberson uplift.

The preservation of Springer shale on the crest of Eola in contact with Viola and Hunton is abnormal since no Springer shale has been found in the surface exposures of the Pontotoc conglomerates in the Arbuckle Mountains. A reasonable explanation is advanced to explain the relationship, namely, the Springer was thrust out over the eroded Eola structure during Arbuckle orogeny.

Subsequent Pontotoc (?) deposition almost completely obscured the sharply folded and faulted Eola pool.

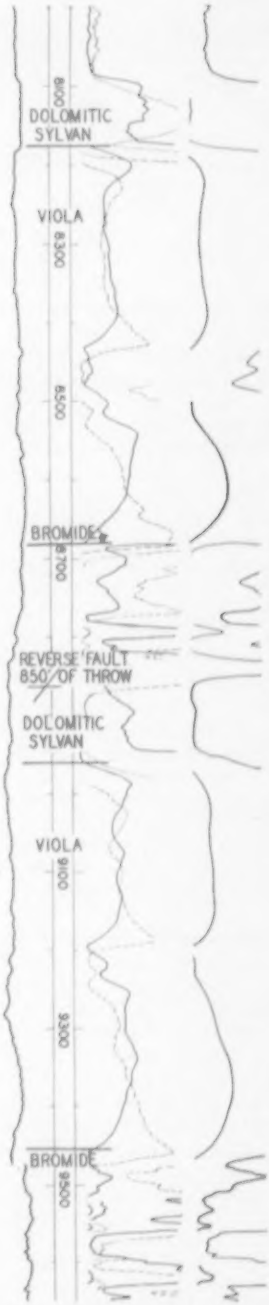


Fig. 4—This well drilled a complete Viola section twice and cut a reverse fault with about 850 ft. of throw. Production occurs below the fault from Simpson sands.

Seismic problems . . . Although the discovery of Eola is credited in part to seismic work, the field is a very poor target for shooting. In all probability, the discovery well was staked on a Permian or Pontotoc (?) seismic high that reflects the underlying complex anticline in a very limited fashion.

Seismic crews must conduct their work 3 to 4 miles southwest of the pool

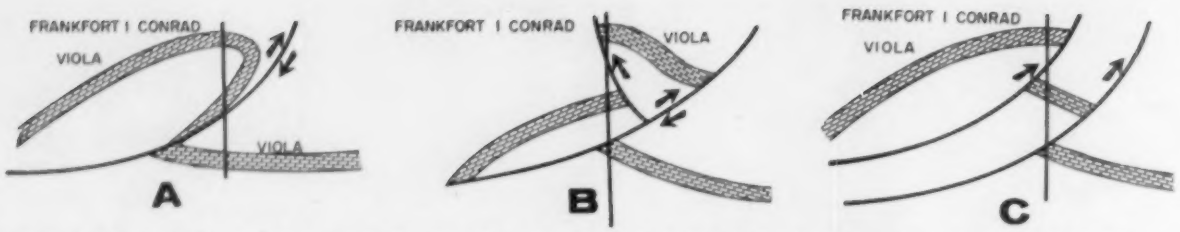


Fig. 5—Frankfort Oil Co. drilled the Viola limestone three timesand established production in the deepest zone in the North Marietta

to map the steeply dipping southwest flank of Eola. Even then, it is highly doubtful if the seismic energy can be picked up because of the complexities of the area.

The central horst, under favorable conditions, might be mapped by seismic surveys. It is necessary, however, to conduct work 1½-2 miles northeast of the horst to map the dips of 30°-45° found in this block.

Shooting in the area is further complicated by the rapid variations in thickness of the Pontotoc (?) conglomerates. Outcrop sections show that these beds consist of boulders derived largely from the Arbuckle formations. The presence of the Arbuckle boulders increases the velocity to 17,000 to 19,000 ft. per second in the Pontotoc (?) section. Velocities in the post Arbuckle beds are on the order of 13,000-15,000 ft. per second. Failure to recognize this velocity problem may result in appreciable errors in determining the depths of reflecting horizons.*

Reservoir rocks . . . Simpson sands are the principal producing zones at Eola but the Hunton is an important producing horizon and the Viola has at least one producer. At least 15 separate reservoirs have produced or are indicated producers at Eola; 7 different zones are oil-bearing—the Hunton, Viola, upper Bromide sands, basal Bromide, upper McLish, basal McLish, and basal Oil Creek. Some wells in the horst have drilled over 300 ft. of Simpson pay; the discovery well, the Sohio 1-A Howard, has produced nearly 1 million barrels of oil since 1947.

Gotebo Area

Subthrust production occurs in the Gotebo area where wells are completed in the Springer sands below a major thrust fault. Stanolind Oil & Gas Co., uncovered this field with its 1 Kennedy (SE NE NW 2-7n-26w). The well entered Mississippian beds below the Permian; it cut the thrust fault at about 2,000 ft. subsea, passing into younger Springer beds.

Subthrust geology . . . The geological interpretation below the Kennedy thrust is very difficult because of additional faulting (Fig. 6). Some geologists consider that the Springer sands are upside down. Others contend that correlations show that the beds are right side up. In any event, the thrusting probably occurred later than Deese deposition since Deese beds are preserved below the Kennedy thrust.

Thrusting or reverse faulting is present in the North Marietta pool where Frankfort Oil Co.'s 1 Conrad drilled the Viola section three times. The third section of Viola tested 10 bbl. of oil per hour. Fig. 5 shows several interpretations to account for this well. Fig. 5A probably is an incorrect solution since the three Viola sections were normal, and none of the zones was upside down.

Other Areas

Many wells in southern Oklahoma have drilled upside-down sections, repeated sections, or have had strong evidence of thrust or reverse faulting.

The first well on the Apache structure drilled the overturned part of the fold, repeating the Viola section. A second wildcat was located 1,320 ft. south of the initial test and became the discovery well in the field. The crest of the Apache anticline at Bromide level is nearly 1,000 ft. southwest of the axis in the shallower beds.

Several other wells in the Apache area have drilled either upside-down sections or show traces of severe compression or faulting.

Future Production

The importance of Eola and other complex fields lies in the lessons that can be learned and that can be applied in finding similar producing areas. Eola has a large producing area on the north flank controlled by a reverse or thrust fault.

Southern Oklahoma must have many areas where similar conditions may exist; that is, intensely folded belts coupled with reverse or thrust faulting. The possibilities of closure against the downthrown side of the reverse fault should be investigated before a structure is condemned.

Undoubtedly other uplifts, similar to the Arbuckle Mountains, have structures on their faulted flanks comparable to Eola. The north side of the Uintah Mountains—the east side of the Bighorn Mountains in Wyoming and the southwest flank of the Central Basin platform in West Texas are only a few.

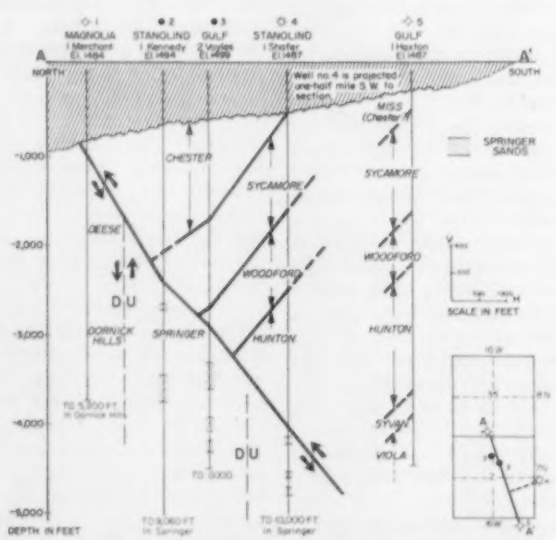


Fig. 6—At Gotebo, Springer sands are trapped against a thrust fault; the subthrust geology is very complex. Cross-section courtesy of P. A. (Polly) Wallace.

*Nugent, L. E., Jr., "Limitations of Seismograph," A.A.P.G. Bull., Vol 37, No. 11, p. 2513, Nov. 1953.

How to Get Manpower for Turnarounds

Union Oil gets the job done by a combination of (1) fixed company crews, (2) semipermanent contractor crews, and (3) variable contractor crews

by John W. Towler

GENERAL maintenance contractor crews are used to provide a fluctuating supply of craftsmen for the major Union Oil Co. refineries at Los Angeles and Oleum, Calif. The procedure involves the use of a combination of fixed company forces, semipermanent contractor crews, and variable contractor crews.

Based upon 6 years of experience with this policy, Union Oil has found that its widely fluctuating manpower requirements for turnarounds can be adequately satisfied.

The Problem

The ever-increasing size and complexity of modern refining units demand large numbers of craftsmen for short lengths of time during periodic turnarounds. This is a demand which in some way must be adequately met. Because of it, the refinery maintenance department must either develop means of utilizing a fairly constant maintenance crew throughout the year, find a large temporary source of qualified craftsmen, or find some other solution.

A variable source of craftsmen recruited from local craft construction sources allows a flexible tailoring of manpower to meet current work requirements. The procedure provides adequate peak manpower far in excess of normal maintenance demands, and eliminates the problems inherent in a wide fluctuation in demand for qualified maintenance craftsmen.

Contributing factors . . . Our problem is a difficult one because of several contributing factors. As refinery facilities are keyed to higher production rates and onstream time is stretched between shutdowns to maximum throughput, an occasional failure may bring several units down together—completely upsetting advance attempts to coordinate work requirements and manpower.

In addition to unexpected peak work loads the nature of jobs performed on various units may be such that the complement distribution from each craft varies considerably. Where one unit may require a majority of pipe fitters to revamp piping, the next unit may require primarily boilermakers to make exchanger, furnace, and tower repairs.

Even when shutdown schedules are met and advance plans for allocating manpower are followed, the work content of the shutdown may change abruptly after the turnaround has begun. Scheduled work may require postponement, due to unforeseen material, equipment, or design problems.

Considerable additional work may be discovered when equipment is opened for inspection, in spite of detailed historical inspection records. Delays in the progress of a job may require added manpower to accelerate the completion according to schedule.

These constantly changing and often unpredictable shutdown manpower demands are always superimposed on a relatively constant amount of maintenance to other onstream units. Emergency repairs, routine servicing, preventive maintenance, dismantling, and minor new construction make continuing demands on manpower.

If we should look at the manpower demands for the period of a year, it might typically appear as shown in Fig. 1. Note the rapid changes in the numbers needed for the various times during the year—they fluctuated from 275 to 675.

Variable Contract Maintenance

A permanently assigned company crew composes a portion of our normal central shops craft force and is augmented by a nucleus of contractor crews supplied under general maintenance contracts. This nucleus is used as a basis around which the contractors can expand out of local construction sources to meet variations in work load due to shutdown needs.

Several years ago this policy of providing manpower for refinery maintenance work was instigated. Refinery forces were augmented to a point where, under normal work-load requirements between major unit turnarounds, a small nucleus of contractor maintenance people would be kept in the refinery to meet the normal maintenance needs.

This nucleus of contractor mechanics was the minimum number, craft by craft, which could be used during maximum manpower needs to act as general foremen, working foremen, etc., in a greatly expanded contractor-supplied work force. This nucleus of contractor personnel was considered as semipermanent, was hand picked for general all-around ability, and had the advantages of knowing the refinery, maintenance organization, operating units, and procedures.

Reference to Fig. 2 indicates an approximate typical relationship between over-all company forces, nucleus contractor forces, and temporary crafts-

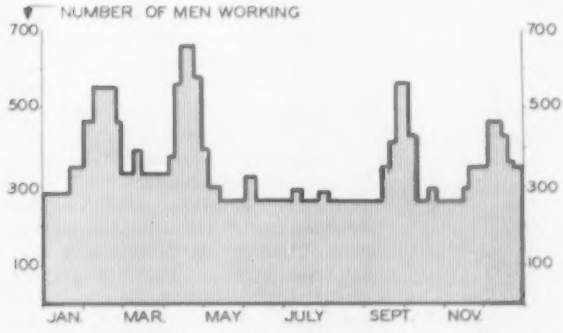


Fig. 1—Typical refinery-maintenance manpower requirements.

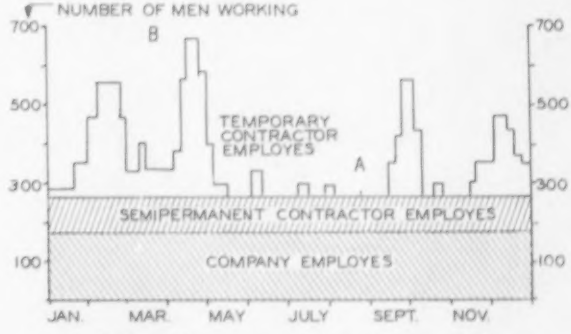


Fig. 2—Variable contract-maintenance manpower forces.

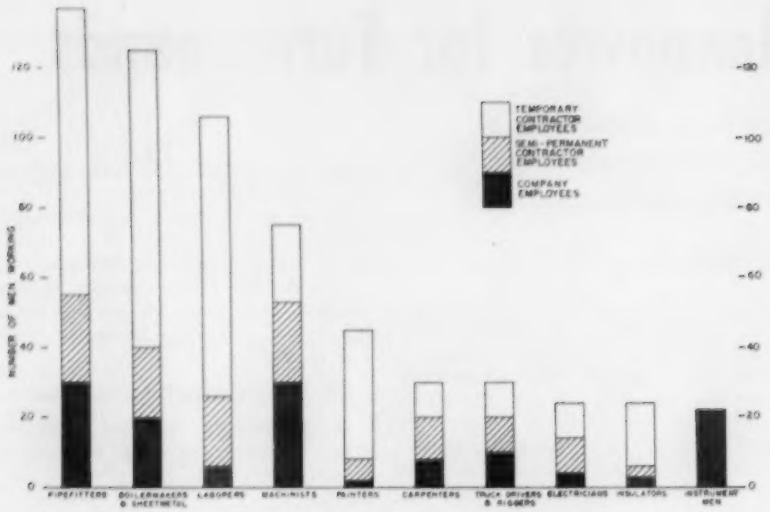


Fig. 3—Typical variations in craft manpower forces.

men brought in for relatively short-duration periods. At point "A" there are no unit turnarounds—maintenance work load is normal. Company maintenance forces number 175, contractor nucleus forces are 100 in number, and there are no temporary contractor forces. Total maintenance people number 275.

At point "B," which represents a major shutdown period, we still have 175 company maintenance people and 100 key contractor people but, in addition, 400 temporary contractor people, to make a total of 675. Each one of the 100 contractor nucleus takes a number of the temporary contractor mechanics and effectively makes use of this augmented crew during the peak manpower situation.

A breakdown of typical variations by craft is shown in Fig. 3. (The dark areas indicate company employes; the crosshatched areas indicate semipermanent contractor employes; and the plain areas indicate temporary contractor employes.) Crafts requiring the largest variations, technical knowledge, or familiarity with the refinery are staffed with the largest nuclei of contractor craftsmen.

Contracts . . . General maintenace contracts at our Los Angeles refinery are written with one contractor to supply all crafts with the exception of painters, insulators, electricians, and brickmasons. These crafts are supplied by individual specialized contractors. At our Oleum refinery one contractor supplies all crafts with the exception of instrument men, who are company employes, and brickmasons, who are supplied by a specialized contractor.

Until 1953, contracts had been cost plus a percentage for field-office expense, overhead, and profit. The percentage was based on direct labor costs. In 1953 the Oleum refinery contract was changed to a guaranteed percentage fixed fee on an estimated yearly payroll.

Direct labor rates are negotiated by the general maintenance contractors with local craft and labor unions. These higher construction rates, plus contractors' fees, are partially offset by the fringe benefits costs which must be considered a part of company craftsmen rates. The cost per hour of contractor labor does, however, exceed the cost per hour of company-employed craftsmen.

Supervision of contractor craftsmen is also subject to construction union contracts, which specify that work direction be given to union craftsmen by union foremen. Definite numbers of foremen are required, based on the size of crew, and foremen rates, as well, are specified.

Fig. 4—Diagram of a refinery-maintenance organization.

Organization . . . The contract maintenance organization, as shown in Fig. 4, is headed by a superintendent who is responsible to the Union Oil superintendent of maintenance and has general foremen or foremen in each craft reporting to him. During turnarounds crews may be large enough to have several subforemen reporting to each general foreman.

The contractor superintendent is provided a field office for himself, his office manager, and several clerks. This office processes the hiring and release of all contractor craftsmen, keeps personnel and time records, and prepares contract payrolls and reports.

The company maintenance organization structure is unchanged by the presence of contract maintenance. Company shop foremen in each craft remain responsible for the quality and proper completion of all work of their crafts, whether performed by company or contract crews. The company shops are divided into two groups, reporting to two master mechanics who in turn report to the company superintendent of maintenance.

A third group responsible for coordination and planning also reports to the company superintendent. This strictly staff group has the major functions of area coordination, daily and shutdown planning and scheduling.

Work planning . . . Day-to-day maintenance is authorized on job orders by the operating departments. Work is defined by craft sequence in detail, estimated, and given priority by area foremen assigned to the five refinery zones. Orders are immediately typed and distributed by the daily planning group to the craft shop foremen for inspection and requisitioning of nonstock material as necessary. After noti-

THE AUTHOR

John W. Towler is manager of the Oleum refinery, Union Oil Co. of California, Rodeo, Calif. He received a mechanical engineering degree from California Institute of Technology in 1930. Since that time he has served in several engineering and maintenance positions in Union's two refineries. Towler served for 8 years as chief refinery engineer at the Wilmington plant immediately prior to appointment to his present position. He has been Oleum manager since October 1953. This paper originally presented at A. P. I. Division of Refining meeting, St. Louis, 1955, under the title, "Use of Contract Maintenance Crews for Large-Scale Refinery Turnarounds."

fication by the shop foremen that job material is available, the daily planning group prepares daily schedules for each craft.

These schedules detail individual craft sequences by priority and are distributed one day prior to schedule to affected operating and maintenance foremen. Consideration is given to grouping at least 8 hours' work for each crew of men in as small an area as possible. More than enough work is scheduled for all available men, including the contractor craftsmen nucleus, so that the work backlog is always pushing the craft forces.

Planning plays an important role in reviewing backlogs as well as current work and in recommending changes in the number of contract men. Changes are approved by the master mechanic, transmitted through the shop foremen, and executed by the contractor general foreman who lays men off or hires additional men from his local construction sources.

Work direction . . . The planning group assumes that all scheduled work is completed as scheduled and proceeds with future schedules on that assumption unless otherwise notified by the company shop foremen. These daily craft schedules, therefore, are the initial basis for daily work direction in each shop. Either company or contractor craftsmen are assigned to cover the scheduled work and have authority to draw upon company stocks of materials, tools, and equipment.

Company craftsmen are given instructions by shop foremen, while contractor craftsmen receive similar work direction through contractor subforemen. These contractor foremen, under the shop foremen's approval, prepare time-distribution sheets for accumulation of job charges and payroll payments.

After delegating jobs in this manner to contractor foremen, the company shop foreman still remains responsible for the maximum utilization of all manpower, tools, and equipment. He sees that craftsmen receive adequate instructions, use proper methods, and are assigned alternate work when jobs do not proceed as scheduled. He also makes certain that correct tools and equipment are provided at the job site.

Turnarounds . . . Turnaround work is handled in much the same manner. It is accumulated by the shutdown planning group, where it is finalized into a shutdown list, detailed into craft sequences, and time is estimated and compiled into a master daily schedule by crafts. The shutdown timing is coordinated with the operating departments and required crews hired by the contractors. Shutdown planning is notified of work which is not completed as scheduled or new work arising during the shutdown.

This work is fitted into the master schedule for succeeding days where allowances have been made for such occurrences. As shutdown, postshutdown, and any overaccumulation of normal maintenance backlog work is completed, the contractor is requested to reduce his crews.

Controls . . . All craft time and materials are distributed against job order numbers. These numbers are selected to accumulate charges against specific equipment throughout the refinery. A monthly statement which shows monthly and year-to-date charges against detailed refinery equipment can thus be distributed to the supervisors responsible.

A monthly budget-control statement is also distributed, reporting total accumulated monthly job charges compared with the amounts budgeted within areas of operating responsibility.

"We found it was the only way we could quiet him."

Other contractors . . . In addition to work performed by the general maintenance contractors, numerous other contractors do specialized maintenance and construction work within the refinery. We have had considerable success with small contractors, especially under fixed-cost contracts. These contractors seem best able to give good technical and cost-conscious supervision on the job.

Examples of contract work so handled are: tank cleaning, tank car repairs, furnace brickwork, wharf repairs, major painting and insulation, weed control and levee maintenance, and dismantling of facilities.

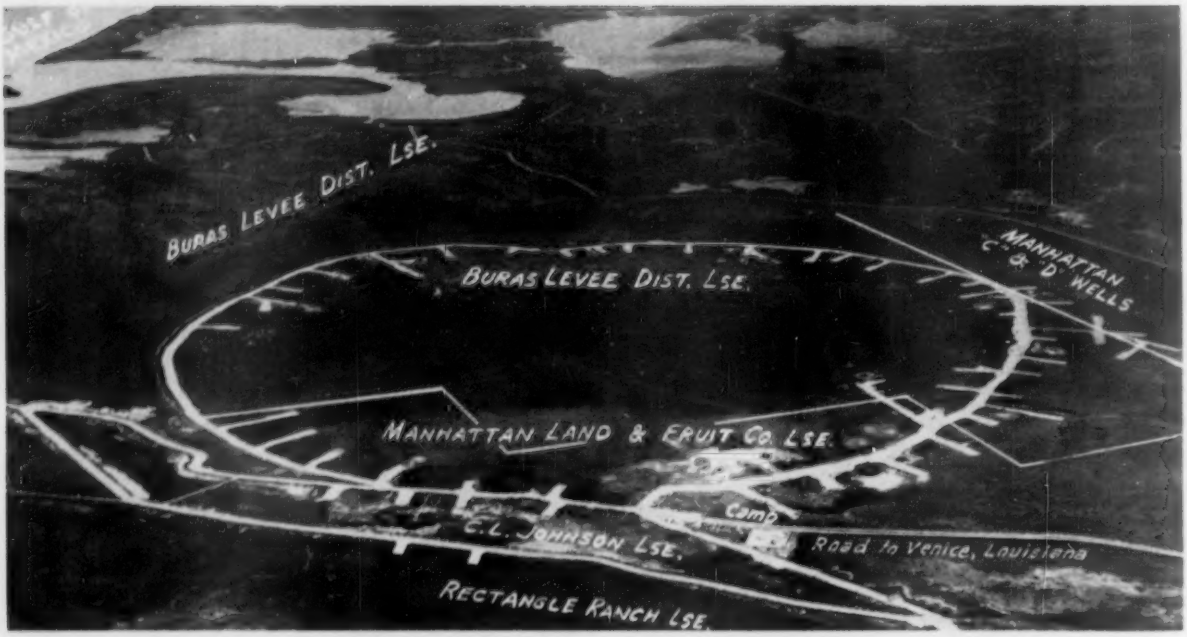
Short Piece of Chain Makes Up Subs in a Hurry

NORMAN ALLEN, drill-stem tester for Sun Oil Well Cementing Co. of Great Bend, Kans., carries an 8 ft. piece of spinning chain in his truck to help in making up and taking down subs used in drill-stem testing. The chain has a T-weld on each end so that he can get easy hold of the chain.

When Allen drives up to a well on which a drill-stem test is to be run, he makes up the necessary connections by sticking the pin end into the boxes,

Length of spinning chain serves drill-stem tester in making up subs.

wrapping up the spinning chain, and whirling it with the chain as shown. When coming out of the hole, the rig crew loosens all the joints and it is a simple matter for Allen to thrown on his spinning chain and whirl off the subs.



AROUND the 8-mile perimeter of this canal system, 137 holes have been drilled. Boats and barges get equipment from camp to location.

An unusual canal system facilitates

Field Operations in Louisiana's Marshes

. . . Venice field's circular waterway outlines an oil-rich structure

SEVERE marsh conditions, a high ratio of successful completions, and unusual operational problems characterize Venice field, operated by Tide Water Associated Oil Co.

Located about 90 miles south of New Orleans near the Mississippi River, Venice field is located exactly at sea level. The nearby conditions require full use of marine facilities, including submersible drilling barges and water transportation.

A total of 37 production sands have been found and the field contains 123 separate oil reservoirs around the piercement-type salt-dome structure. The prolific field has resulted in 137 holes being drilled, with only 11 being dry.

The surrounding terrain and the field location have provided it with unusual operating problems, including high-pressure salt-water sands, salt contamination, and heaving shale. Strict pollution control is also an operational practice and problem.

Field background . . . On the surface, Venice field contains 8 miles of dredged canals which make a huge circle 2½ miles in diameter. Slots extend outward and inward from the main circle, and were used for drilling barge locations. The pattern is such as to outline the flanks of the salt dome.

Tide Water is the operator of the entire field which consists of six leases, containing a productive area of approximately 2,000 acres. Tide Water owns a 50 per cent interest in the field and has as partners, Gulf Refining Co. and Humble Oil & Refining Co.

In 1934, Venice Corp. (Col. E. H. Simms) acquired operation of the property. This organization drilled two tests near the flank of the dome which proved nonproductive.

In April 1936, Tide Water acquired operation by purchase and oil payment and completed the first successful oil well July 18, 1937. This was on the east flank of the dome with the 3 Manhattan Land & Fruit Co., in a sand found at 7,182-7,202 ft., the sixth test drilled on the dome. After drilling several other wells on the east flank of the dome, Tide Water undertook a geophysical survey in 1939 to outline accurately the position of the salt stock.

This survey resulted in December 1939 in discovery of production in the 6 Buras Levee Board on the west and previously undrilled portion of the field. This location, based on geophysical information, was 1½ miles west and across the dome from the last completion made. It was completed in a 200-ft.-thick sand at an approximate depth of 10,500 ft. This sand became the primary objective of many subsequent wells.

Geology . . . The oil is found at Venice in approximately 37 Miocene sands ranging in depth from 3,500 to 14,700 ft. These sands lie at rather steep angles against the almost vertical sides of the salt mass. This is a piercement-type dome, the salt having intruded upward into the sedimentary formations of sand and shale.

Test wells have been drilled into the top of the cap rock by Freeport Sulphur Co. in the search for sulfur. Commercial amounts were not found.

Drilling Program

Continuous development of known reservoirs has been carried on since discovery of the field. The semiexploratory type of well is designed to increase

the known limits of the oil band in both upstructure and downstructure directions. The exploratory type of well is being drilled farther out on the flanks of the field in an effort to find deeper sands than presently penetrated by the regular field wells.

A recent test in this classification was the 24 Manhattan Land & Fruit "A" drilled to total depth of 15,522 ft. and bottomed in salt. Production was obtained in a new sand at 14,662 ft.

Field description . . . Canals are dredged to each location and equipment and personnel are transported by boats and barges. As drilling progressed around the dome, canals were extended until a complete circle was finally made and numerous slips dredged both inward and outward as locations are drilled. Drilling has been done only with rigs mounted on submersible barges.

Lease tank batteries have been constructed on piling at strategic locations around the dome to which individual well flow lines are connected. The oil is then pumped 4½ miles to a barge-loading terminal on the bank of the Mississippi River. On the southeast edge of the field the ground has been built up with the use of dredging spoils.

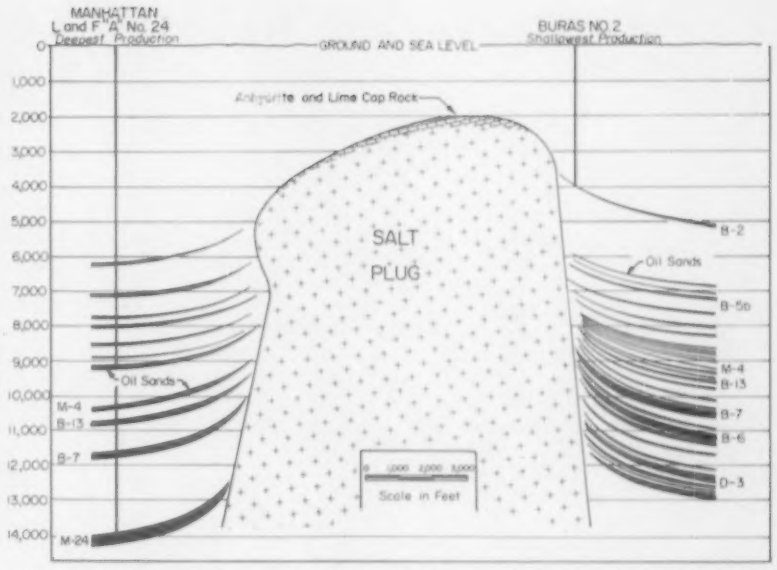
On this high ground have been built the field office, warehouse, shops, bunk houses, boarding house, dwelling houses, facilities for storing oil-field equipment, and compressor plant. Field personnel are furnished speedboats instead of automobiles to perform their various duties in drilling and maintaining production from the field. Work boats instead of trucks are used for routine field work.

High pH, red lime muds emulsified with either oil or graphite are used in drilling wells at Venice. Three general casing programs are used. For general field drilling, one of the two following programs is used:

1. One program calls for 220 ft. of 16-in. surface casing followed by 2,500 ft. of 10¾-in. casing, then 7-in. casing is set at total depth. In some cases 5-in. liner is run below the 7-in.

2. The other program for normal field wells consist of 220 ft of 13⅜-in. casing followed by 2,500 ft. of 9⅝-in. casing, then 5½-in. casing is set at total depth.

Completion procedure . . . Casing is set at total depth on all wells at Venice and completion is made by perforating opposite the deepest oil sand penetrated. Due to an active water drive in most of the reservoirs the wells flow to a near depletion. After they cease to flow, further recovery is obtained with the use of gas-lift flow valves. After a sand is depleted of all commercial



A TOTAL of 123 separate reservoirs in 37 sands have been formed by the intrusion of the salt plug at Venice field.

production, the well is plugged back to the next sand and the same practice applied as before.

For cheaper operation in recent years the Venice wells containing multiple pays have been initially completed, using permanent-type equipment, setting packer above the shallowest oil sand and completing in the deepest one.

Plugbacks and recompletions in upper sands may then be accomplished with the use of company wire-line equipment at a much lower expense than with the use of a rig. The normal field well drilled to 11,000 ft. will require an average of 18 days to move in, drill, and set two strings of casing; 5 days' additional time is required to set the oil string and complete, or 23 days' total time. This depth of well costs approximately $140,000.

When drilling exploratory wells around the flanks of the dome protective casing may be set from 7,000 ft. to as deep as 14,000 ft. in order to safely drill and explore to 16,000 ft. A recent exploratory Venice well set 14,000 ft. of 9⅝-in. casing.

Gas sales . . . Associated gas production is gathered from the field and moved to a compressor plant where it is delivered to United Gas Pipeline Co. Tide Water delivers 19,600 M.c.f. of gas per day. United Gas Pipeline has a transmission line which extends from the mouth of the Mississippi River northward to New Orleans. Average field production is 14,100 bbl. per day. Cumulative production to January 1, 1955, has been 55,786,000 bbl.

Venice field has a high-pressure gas line circling the field which is used for furnishing gas to gas lift 17 wells.

Operational problem . . . Inherent conditions of the field have meant that operational problems have been magnified. While each one alone is not necessarily unique, the accumulative effect makes the field a real study in petroleum engineering. Salt contamination results from the drilling into the salt stock and requires use of proper mud system for handling this condition.

Salt-water flow . . . When salt-water sands are penetrated with too light a weight drilling fluid the salt-water pressure overcomes the weight of the fluid column and flows out of the hole, resulting in stuck drill pipe or loss of the hole.

Some portions of the field are underlain by shales containing fine particles of sand and entrained gas. While drilling in this zone, gas enters the mud system and as it approaches the surface, forms into bubbles which lighten the weight of the mud, resulting in heaving or flowing. The shallower sands may then sluff and fall into the hole and cause the drill pipe to be stuck.

Pollution . . . Great precaution is taken to prevent polluting the canal water with oil, chemicals, or contaminated salt water which are detrimental to marine life.

None of the formations in the immediate area contain fresh water. All fresh water for drilling operation must, therefore, be hauled by barge.

It is necessary to continuously check the direction of the drill hole by the use of directional surveys since most of the wells drift in toward the salt when penetrating steep formations such as those at Venice.

Table 1–Fracturing Treatments in the Wilcox Sand

Field and county—	Gal. gel	Lb. sand per gal.	Production, M.c.f.d. Immed. before	Immed. after	Six months after
Hagist Ranch, Duval	840	0.48	1,029	2,710	
Hagist Ranch, Duval	5,000	2.5	500	*1,387	*1,528
Hagist Ranch, Duval	1,400	0.7	110	1,004	
Hagist Ranch, Duval	5,000	2.0	265	660	428
Hagist Ranch, Duval	2,000	1.0	1,590	*2,040	*1,742
Hagist Ranch, Duval	5,000	1.0	1,500	*1,830	*1,969
Hagist Ranch, Duval	5,000	1.0	485	*1,560	*1,619
Hagist Ranch, Duval	5,000	1.0	1,824	*2,090	*2,243
Hagist Ranch, Duval	5,000	2.0	194	*1,530	*1,810
Hagist Ranch, Duval	5,000	2.0	1,300	*1,958	*1,760
Hagist Ranch, Duval	5,000	2.0	130	*1,160	975
Hagist Ranch, Duval	5,000	2.0	771	3,070	800
Hagist Ranch, Duval	4,000	2.0	253	*1,884	†1,963
Weesatche, Goliad	5,000	1.0	160	*1,500	*1,313
Arneckeville, DeWitt	7,500	2.0	0	786	*1,020
Thomaston, DeWitt	5,000	2.0	0	622	*761
Clay, West, Live Oak	5,000	1.5	0	885	927
Chicolete Creek, Lavaca	7,500	2.0	‡6,000	‡23,500	Shut in
Retreat, Grimes	2,000	1.0	§4	0	P&A
South Caesar, Bee	2,000	1.0	§9	§55	*41
Boyce, Bee	5,000	1.0	§32	§71	*55

*Limited by allowable or market. †Production 2 months after fracture job. ‡Open flow potential. §Barrels of oil per day.

22-Day Payout for Wilcox Fracturing

Average cost $3,000 . . . average revenue increase $135 per day. That's been Atlantic's experience with 21 wells shown in above table.

by W. G. George, A. J. Pearson, and R. D. Patterson

ATLANTIC REFINING CO. has fractured 21 wells which produce from the Wilcox formation in Texas. The results of these treatments are shown in Table 1.

- The average cost of fracturing these wells has been about $3,000 and the average increase in revenue has been approximately $135 per day. In other words, the average well has paid out the cost of the fracture treatment in about 22 days.
- Twenty of these twenty-one fracture jobs have been successful. The one fracture job which is considered a failure resulted in a large increase in water production, although the oil production was not appreciably increased.
- In gas wells fracturing has increased deliverability. Since spacing in many gas reservoirs is, or should be, determined by the deliverability of the wells, fracturing should allow us to drill gas fields on wider spacing and thus prevent waste of resources and steel.

Authors are with Atlantic Refining Co., Dallas. Paper presented at 1955 T.P.R.C. meeting, College Station, Tex.

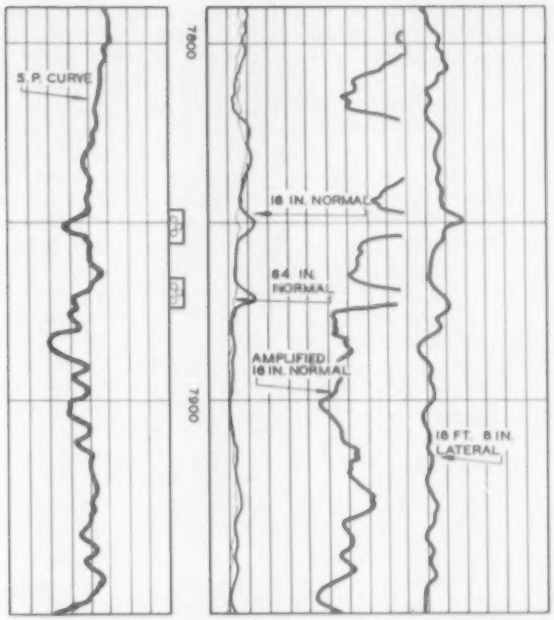
Where they are . . . In the area of Atlantic's operations, the Wilcox formation is usually found at depths of 6,000 to 8,000 ft. and covers an interval of about 3,000 ft. The sands are usually fine to medium grained and vary in permeability from less than 1 md. to several thousand millidarcies.

The Wilcox is distinguished by alternate intervals of sand and shale, and it is not unusual to find thin streaks of permeable sand separated by very low-permeability sand and shale. Many of the gas fields in the Wilcox produce from two or three sand bodies, separated by 10 to 20-ft. shale breaks. In some of these field it is very difficult to correlate the sand and shale streaks between offset wells; however, these sand intervals have common water tables, and experience in many cases has shown that the sands are common reservoirs.

In such areas, the wells are usually completed in several sand zones including as much as 100 ft. of interval. In other areas, the various sands of the Wilcox have varying fluid contacts and are clearly separate reservoirs. It is not unusual to find oil in an upper sand body and gas in a lower with water sands between. In such cases, wells are either completed in a single sand zone or dually completed between two sand bodies.

Because of the variation in Wilcox reservoirs and in completion methods, there is no standard treatment for the Wilcox. Each well must be considered separately and the treatment designed accordingly.

Successful job . . . One example of a highly successful fracture job was a well drilled in DeWitt County in 1943. The electric log for this well is shown in Fig. 1. An open-hole drill-stem test in the Wilcox showed only 1 psig. surface pressure and only 240 ft. of gas-



ELECTRIC LOG for DeWitt County well drilled in 1943. Eleven years after abandonment, well was reentered and fractured. It is now a profitable investment. Fig. 1.

cut mud was recovered. Core analysis of the interval indicated 16 ft. of sand with an average air permeability of 23 md. and an average porosity of 19.7 per cent. This sand was described as very hard, tight, and fine to medium grained. This well was plugged and abandoned without setting casing.

In March 1954 the well was reentered, 11 years after abandonment. The well was redrilled to 8,500 ft. without trouble, and casing was set after running new logs. The well was perforated and tested with maximum surface pressure of 1½ psi.

The rig was released, and a swabbing unit moved in. The well was swabbed intermittently over a period of 8 days recovering salt water with a small amount of oil and occasional heads of gas. The well was then fractured with 5,000 gal. of acid gel and 10,000 lb. of sand.

After fracturing, the well was opened up and flowed diesel oil and gel with heads of gas. It later began making heads of water and gas and was shut in waiting on market connections.

In September the open-flow potential was 8,600 M.c.f.d. and the shut-in tubing pressure was 2,441 psig. The latest test shows that the well is now producing 900 M.c.f.d. with 25 bbl. of distillate and 15 bbl. of water per day.

This well is an example of one benefit of fracturing. In this case, a noncommercial well has been turned into a profitable investment.

The primary factors affecting the success of a fracture job are the type and amount of fracturing fluid, the injection rate, sand concentration, completion practice, and the nearness of fluid contacts. Each of these factors will be discussed individually.

Volume of fluid . . . The volume of fluid is of primary importance. Fracturing increases the productivity of a well in two ways: (1) by fracturing past and eliminating formation damage and (2) by increasing the effective well-bore radius. While only a small volume of fluid is necessary to eliminate formation damage, productivity increases due to increasing the well-bore radius vary with the amount of fracturing fluid used.

In other words, if all other factors are equal, larger fluid volumes create longer fractures and effect greater productivity increases.

Type of fluid . . . The ideal fracturing fluid should have the following characteristics:

1. High viscosity at bottom-hole temperature.
2. Low leakoff into fracture walls.
3. Easy return to well bore on production.
4. Low cost.

A low formation breakdown pressure is very desirable from a mechanical standpoint. This is best accomplished by using a penetrating or low-viscosity fluid which would not meet the other requirements for a fracturing fluid. Ordinarily a light crude or diesel oil is used to break down the formation and establish the injection rate.

If a low viscosity treating fluid is used, only a short fracture will be formed before all the fluid injected penetrates the formation along the fracture walls. When this point is reached, the fracture is no longer extended and the well sands up.

If a high-viscosity treating fluid is used, very little of the fracture material penetrates or leaks off to the formation from the fracture walls and most of the fluid injected may be used to extend the fracture. In order to achieve this low leakoff an acid or "soap" gel (mostly acid gel) has been used on Atlantic's fracture jobs in the Wilcox. These gels have a high viscosity at bottom-hole temperature and do not readily penetrate the formation.

In the area of Atlantic's operations, bottom-hole temperature in the Wilcox has varied from 180° to 300° and this high temperature has caused reluctance to use low-gravity crude as a fracturing fluid. This does not mean that crude or gelled crude could not be used satisfactorily as a fracturing fluid. The crude or gelled crude would have one definite advantage in reduction of cost.

It is desirable to use a fracturing fluid that will easily return to the well bore. One means of aiding this is to inject a light crude or diesel oil ahead and behind the fracturing gel. In gas wells shorter cleanup periods are required when distillate or diesel oil is used instead of crude oil.

Injection rate . . . All other things being equal, the higher injection rates create longer fractures and greater productivity increases. Most of Atlantic's wells in the Wilcox trend are equipped with 2-in. tubing. Because of friction loss in the tubing, surface injection pressures have been high and injection rates have been relatively low, from 2 to 4 bbl. per minute.

Sand concentration . . . The sand concentration used by Atlantic has been about 2 lb. per gallon of gel. A 40 to 60-mesh sand has been used on most jobs. If long fractures are formed, it is desirable to inject as much sand as possible. If short fractures are formed, the amount of sand injected is not critical. However, because the cost of sand is small in comparison with the cost of the gel, it is believed best to use as high a concentration as possible without danger of sanding up.

Of the 21 wells treated by Atlantic, sanding up has occurred in two cases. In both cases the wells were swabbed in without any additional expense.

Completion practice . . . Our experience has shown that a new well should be

cleaned by natural flow, artificial lift, or swabbing prior to fracturing. This tends to eliminate possible decrease in fracture conductivity due to mud plugging the sand in the fractures.

After the formation has been fractured, it is important to keep foreign fluids from entering the fracture. This makes it desirable to fracture with producing equipment in the hole if the reservoir pressure is greater than can be controlled by formation fluids.

One example of how completion practice affects fracturing results is Well "J." In this well, the upper Wilcox sand was the upper zone of a dual completion. After perforating, this zone made 771 M.c.f. per day with a tubing pressure of 525 psig. After the very successful fracture treatment, this well produced at the rate of 3,070 M.c.f. per day with 2,150-psig. tubing pressure. Mechanical failure incurred in completing the lower zone made it necessary to kill the well with salt water and later salt-water-gel mud. When the well was finally completed, the upper Wilcox produced only 2,077 M.c.f. per day with a tubing pressure of 787 psig. In short, killing the well with mud after the fracture nullified much of the benefit of the fracture treatment.

Nearness of Fluid Contacts

Since the first field tests, fracturing of wells producing water or with abnormally high gas-oil ratios has been considered hazardous. This would be expected in most cases where vertical fractures are formed.[1] This does not mean that water production eliminates a well for fracture treatment.

One well was a comparatively poor producer in a water-driven reservoir. Before the fracture treatment the well had produced 173,000 bbl. of oil, but production had declined to 7 bbl. of oil per day and 3 bbl. of water (30 per cent water).

After the fracture treatment, the well produced 55 bbl. of oil per day with 74 per cent water, which is the pump capacity. The increased production due to fracturing has been more than 12,000 bbl. of oil in the 20 months since treatment.

Future Problems

One of the still unanswered problems in fracturing the Wilcox is the effect of fracturing wells producing water or with abnormally high gas-oil ratios. As yet, we have not been able to predict the success of such fracture jobs and additional study of this problem is warranted.

Another problem which has been mentioned is fracturing dually completed wells. No completely satisfactory method for fracturing the casing zone of dual wells has yet been devised. This is almost an individual well problem since Wilcox formation characteristics vary so widely.

We believe that shale breaks may limit the vertical extent of a fracture in the Wilcox;[2] however, the thickness of shale needed to restrict the fracture is unknown. There are many Wilcox oil and gas reservoirs separated from water sands only by thin shale breaks.

The problem of refracturing or of using larger fracture volumes is an important one. Two Atlantic wells have been refractured. On initial test one well flowed 1,022 M.c.f. of gas per day with a tubing pressure of 700 psig.

After a very successful fracture job using 840 gal. of gel and 400 lb. of sand, the well flowed 2,710 M.c.f. of gas per day with a tubing pressure of 2,088 psig. In 2½ years, this well declined to about 500 M.c.f. per day into the high-pressure gathering system. After refracturing with 5,000 gal. of gel and 12,500 lb. of sand, the well flowed more than 2,000 M.c.f. per day. Both the original and second fracture job on this well are considered successful.

Even though two Atlantic wells have been successfully refractured, the desirability of using larger volumes initially and the feasibility of refracturing are still open to question.

Use of larger volumes increases the desirability of reducing the cost of the treatment, primarily the cost of the gel. It is possible that formation crude, distillate, or diesel oil can be inexpensively gelled (several such gelling agents are now available) and used to carry the sand in these high temperature holes.

Another problem in the Wilcox is presented by the wells that are commonly completed in several sand bodies. It is believed that only one zone is fractured in these cases, although it would be desirable to be able to fracture each set of perforations separately. Further study and field tests are necessary to find a satisfactory method for cheaply fracturing each zone.

References

1. Clark, J. B., "A Hydraulic Process for Increasing the Productivity of Wells," Transactions A.I.M.E. (1949) 186, p. 1.
2. Harrison, Eugene; Kieschnick, W. J., Jr.; McGuire, W. J., "The Mechanics of Fracture Induction and Extension," Journal of Petroleum Technology, October 1954, p. 45.

BOOKS

BASIC LUBRICATION PRACTICE. By Allen F. Brewer. Published by the Reinhold Publishing Corp., 430 Park Avenue, New York 22. 286 pp., $6.75.

Plant operators and lubrication engineers will find this test a helpful one-volume digest of information needed to choose and use the most effective lubricant for industrial and power-plant machinery. It offers complete coverage of lubricants for all types of machinery, along with dual viscosity figures (both centistokes and Saybolt). Fully illustrated and bolstered by many lubrication charts and tables, it includes numerous literature references to guide the reader to more specific information on many topics.

THE SCIENCE OF PETROLEUM, VOLUME 5, PART 3, REFINERY PRODUCTS. General editors Benjamin T. Brooks and A. E. Dunstan. Published by Oxford University Press, 114 Fifth Ave., New York 11. 397 pp., $32.50.

This volume presents 23 separate papers written by 38 petroleum technologists, American and British, concerning the latest advances in the field of refinery products. Subjects range from manufacture and testing of aviation fuels to Raman spectroscopy. Each paper is fully illustrated and has a comprehensive bibliography.

THE 85 PER CENT MAGNESIA INSULATION MANUAL. Published by the Magnesia Insulation Manufacturers Association, Washington 4, D. C. 80 pp., free to those concerned with heat insulation if requested on company letterhead.

This is the revised second edition of the manual first published in 1949. It offers new engineering and product data on the insulation properties of 85 per cent magnesia, its new higher conductivity, water resistance, density, and fire resistance. A special section is devoted to recommended application techniques for hot piping and equipment. Tables included cover the new simplified thicknesses to which the magnesia and diatomaceous silica pipe insulation are manufactured to replace such obsolete thickness as "standard." Nominal and actual thickness are given for pipe sizes up to 24-in.

CONTRIBUTIONS TO THE GEOLOGY OF NORTH DAKOTA. Bulletin 28 of the North Dakota Geological Survey. For copies write State Geologist, University Station, Grand Forks, N. D. $1.

This bulletin consists of 11 short papers written by the staff and students of University of North Dakota. The articles are reprinted from "Compass," a publication of Sigma Gamma Epsilon, geological honorary society. Also available is Investigation No. 18, "Geology of the Elkhorn Ranch Area, Billings, and Golden Valley Counties," as prepared by B. M. Hanson, geologist. A combined geologic and surface structure map accompanies this report, along with a correlation chart showing eight stratigraphic sections measured in the map area.

THE CHEMISTRY OF PETROLEUM HYDROCARBONS. Volumes 2 and 3. Edited by Benjamin T. Brooks, Cecil E. Boord, Stewart S. Kurtz, and Louis Schmerling. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22. Volume 2, 448 pp., $13.50. Volume 3, 690 pp., $18.

Compiled with the aid of 60 outstanding contributors, this series presents a complete range of information on the scientific fundamentals of hydrocarbon chemistry.

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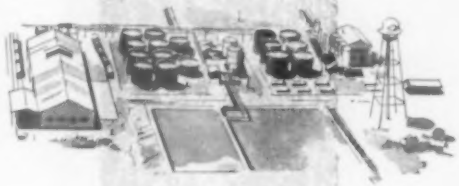

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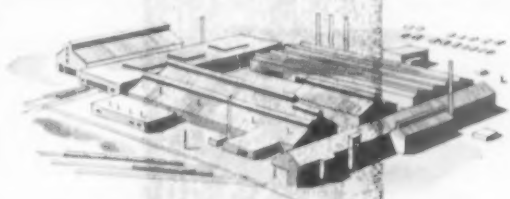

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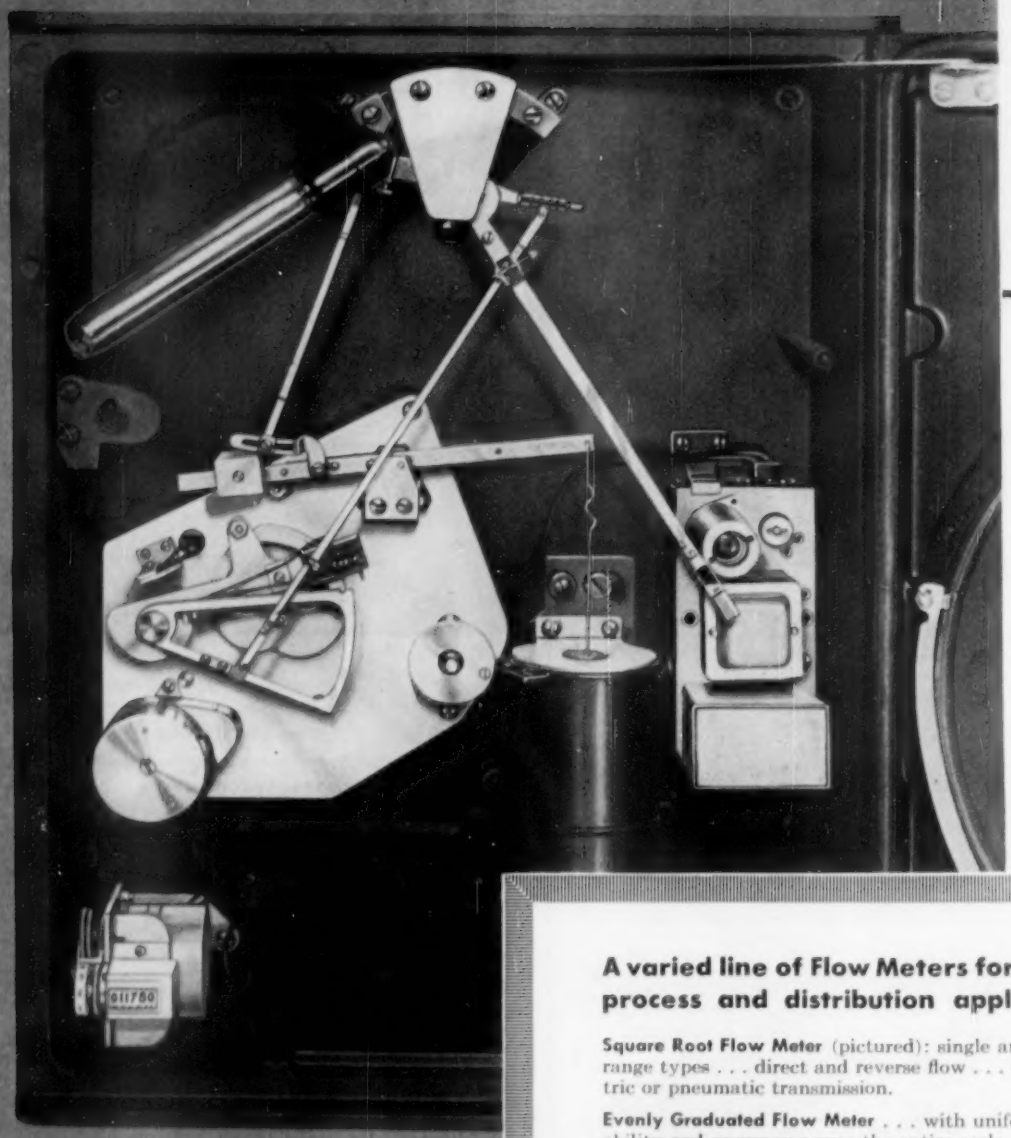

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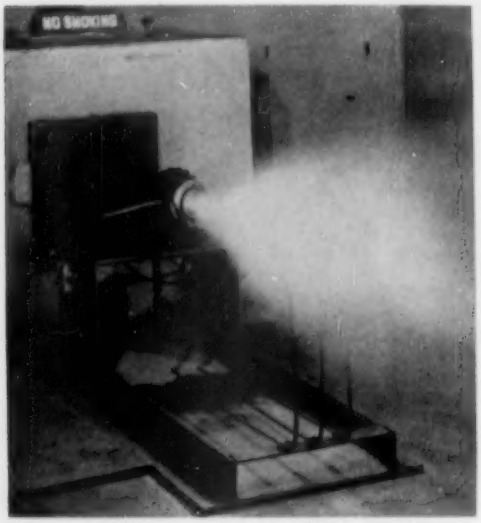


ROCKET FUELS being fired in the Bartlesville laboratory. Note that they burn with little flash and no smoke.

IN THIS 2,500 cu. ft. per minute Kathabar unit, the air-washer chamber is on the right and the contactor section is on the left behind the piping.

Here's the system that Phillips uses to achieve . . .

Humidity control for rocket-fuel testing

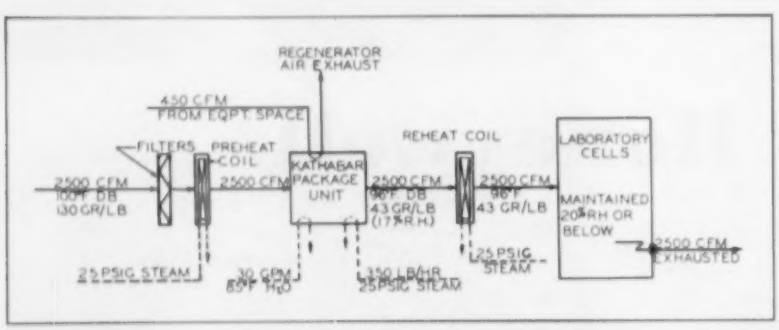
by F. M. Thomas

A constant control of humidity is necessary for rocket-fuel development and testing to assure test accuracy. This chemical-type dehumidification system, used in its Bartlesville laboratory, has been found by Phillips Petroleum Co. to maintain the desired conditions effectively and economically.

WORKING under a United States Air Force contract, Phillips Petroleum Co. is utilizing related petroleum and chemical technology, and their research knowledge and experience to develop new solid rocket fuels. These propellants are prepared and tested in small rocket motors in Phillips' Bartlesville, Okla., laboratories.

The chemical-type humidity conditioning system which serves this laboratory, plays a vital role in the success of this program. Some of the chemicals used to compound these propellants are extremely hygroscopic. Both the physical and ballistic properties of the propellants are dependent on moisture present during processing. Tests on successive charges from a single batch could vary widely if change in moisture content occurred.

Author is with Thomas Engineering Co., Tulsa, Okla.

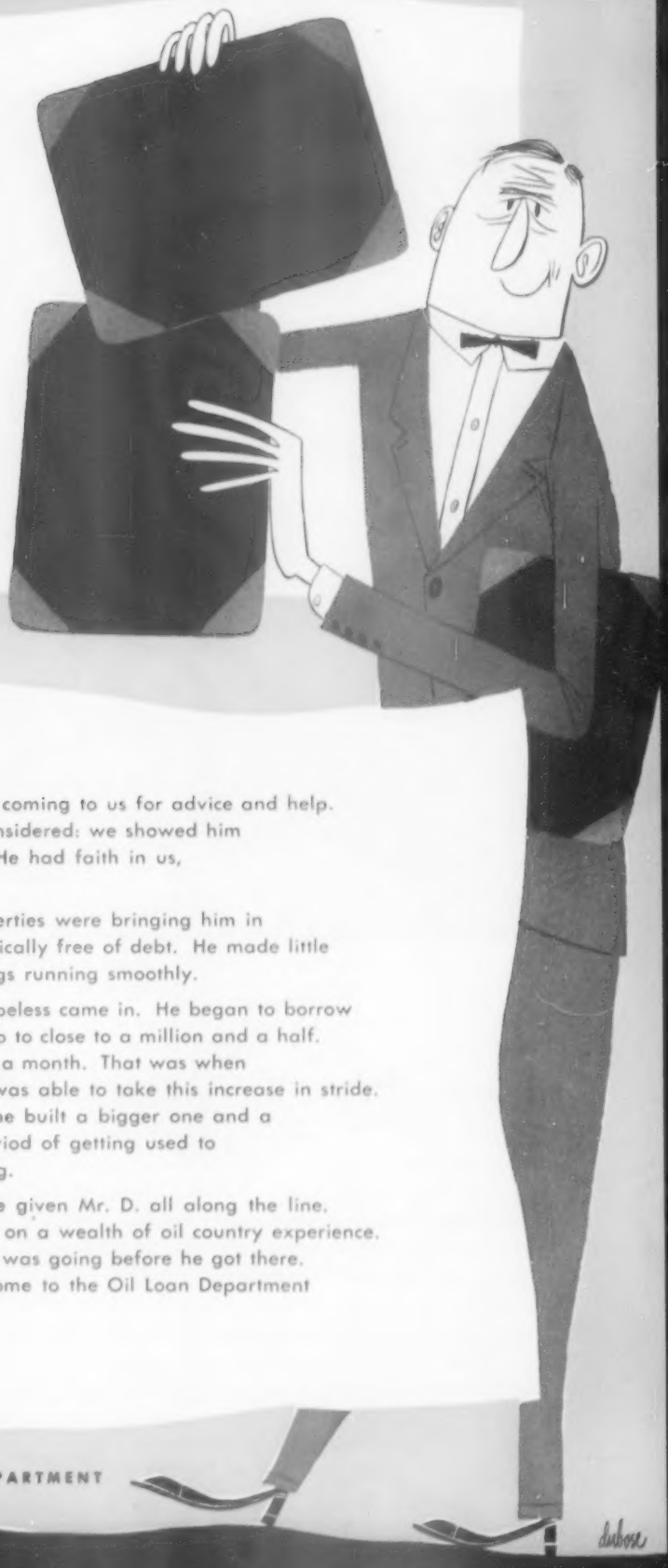


THIS SCHEMATIC flow diagram of the Kathabar air-conditioning system is based on maximum summer design. Utility requirements and the delivered-air moisture content are lower when outside air conditions are less.

Need for humidity control . . . Much of the solid propellant fuel development is "classified" for security reasons. Actual components cannot be named. It can be said, however, that the principal ingredients are a chemical oxidizer mixed with a binding agent which serves as the fuel. It differs from liquid jet-aircraft fuels in that it doesn't require oxygen from the outside to burn.

Some of the chemicals used to form these charges are hygroscopic and are dried before use. To protect their physical properties during compounding and to insure accurate ballistic results from an entire batch, each charge must be protected from moisture regain. Initially, a desiccant system was in-

Mr. "D" came for advice



When Mr. D. first got started he began coming to us for advice and help. We helped him in a way that he had not considered: we showed him the need for building a good organization. He had faith in us, and he did build a good operation.

Mr. D. was doing pretty well. His properties were bringing him in around $25,000 a month, and he was practically free of debt. He made little deals all the time, just enough to keep things running smoothly.

Then a wildcat that was considered hopeless came in. He began to borrow to define his field limits, and his debt ran up to close to a million and a half. But his income jumped to around $100,000 a month. That was when Mr. D.'s organization paid off for him. He was able to take this increase in stride. With the nucleus of a strong organization, he built a bigger one and a strong one. Instead of having a difficult period of getting used to bigger operations, he sailed smoothly along.

We are proud of the help that we have given Mr. D. all along the line. We helped him with impartial advice based on a wealth of oil country experience. We helped him because we knew where he was going before he got there. This sort of help is why oil men **going up** come to the Oil Loan Department of The National Bank of Commerce.

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stalled to maintain conditions in the laboratory cells at from 25 to 30 per cent relative humidity. In this humidity range the moisture in the air and that in the chemicals were barely at equilibrium.

This dehumidifying equipment proved unsuccessful because it could not handle the sudden, high moisture loads placed upon it. Many of the test cells are regularly hosed down to cleanse the surfaces of accumulated propellant dust particles.

After various other systems were investigated, a very successful chemical-type dehumidification system was installed. These units, two of which are used in the laboratory, are Kathabar humidity conditioners, manufactured by Surface Combustion Corp. of Toledo, Ohio.

Air-conditioning system . . . Note on the accompanying schematic flow diagram of one of the systems that all fresh air is used to avoid the accumulation of rocket-fuel dust on the filters or in the ductwork.

The 2,500 cu. ft. per minute of air is shown entering the system at 100° F. dry bulb and 130 grains of moisture per pound, maximum summer design conditions. This air passes through filters and enters the air-washer chamber of the Kathabar unit. Both the preheat coil and the afterheat coil are for winter operation.

The Kathabar system uses a liquid absorbent called Kathene. Its moisture-absorbing capacity is a function of its concentration and temperature. Thus, the Kathene solution at a set concentration is cooled in the air-washer chamber to the temperature predetermined for proper dehumidification. Automatic regeneration in a separate chamber is accomplished by heating the solution with steam.

In the air-washer chamber, the air stream contacts a flood of the Kathene solution as both pass over the extended-surface cooling coils. The coolant in these coils both cools the absorbent solution to the right temperature for dehumidification and cools the air. The air is dehumidified and goes on to the distribution duct system. The solution falls into a sump from which it is pumped back to the top of the air-washer chamber for additional dehumdification passes. A small quantity of solution is also pumped to spray heads in the regenerator.

When the solution becomes diluted, steam is passed through the coil in the regenerator. This heats the solution, forcing it to give up the absorbed moisture. The solution falls into the sump once more and the released moisture is entrained by a scavenger air stream, 450 cu. ft. per minute as indicated on the drawing, and vented outside. Regeneration is completely automatic, as needed.

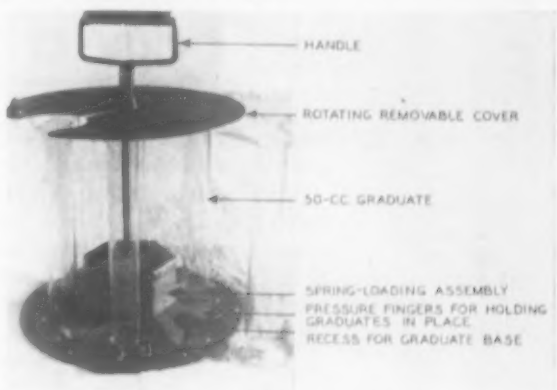
After the dehumidification pass, the air, at 96° F., 46 grains per pound (17 per cent RH) is ducted to each test cell. The cells are constructed of double-reinforced concrete, 1 ft. thick. They are baffled to contain shrapnel in case of an explosion. Blowout panels would allow the explosion force and gases to escape.

Maximum utility requirements of this system are 30 g.p.m. of 850° F. water and 350 lb. per hour of 25-psig. steam. The unit has a wide range of turndown. When outside conditions are not maximum design, it will deliver air at 17 per cent RH and even much lower still using only 85° F. water. Less steam is also required when outside conditions are below 100° F., and 130 grains per pound. The second unit, 1,350 cu. ft. per minute capacity, is now placed on standby. Connected to the same duct system, it can be utilized if increased activities should overload the first unit or when planned expansion is authorized in the future. All ductwork in the system is interconnected to allow the entire 2,500 cu. ft. per minute to be directed to one, two or any combination of test cells if needed.

In the southwest, electric power is more expensive than any other energy source. Since this unit has only a ¾-hp. pump motor and a 1-hp. regenerator air fan, operating costs compared to other systems are much less. Since these are the only moving parts of the system, only routine maintenance is necessary.

Another factor in favor of this system is that there is no carry-over of absorbent solution in the leaving air stream. Carryover of any kind would impair the accurate compounding and testing of rocket charges.

Here's a handy portable-sampler design



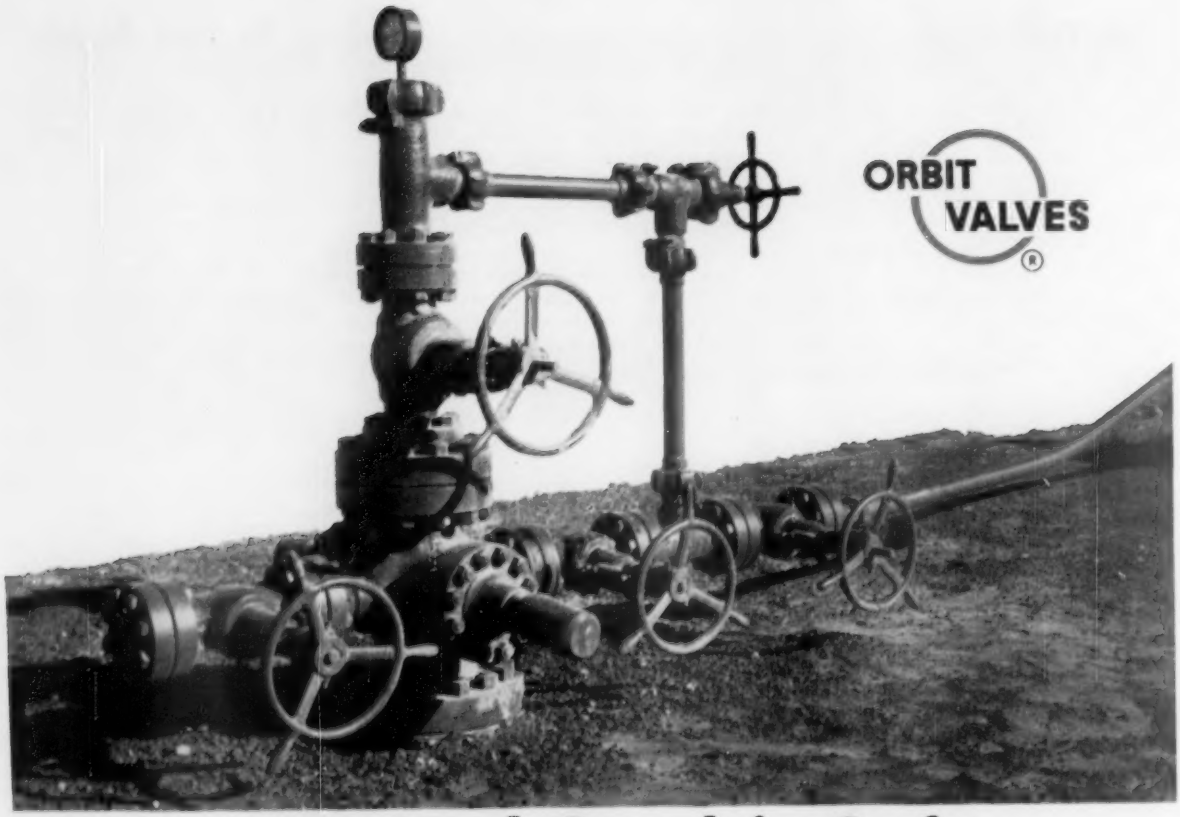
WHERE samples must be taken on several different streams at intervals in the plant, it is advantageous to use a portable sampler that will carry a number of graduated cylinders. The photo shows construction of one such sampler that will hold six graduates. It is used for taking A.P.I. gravity samples on fractionating columns. With this sampler, there is less chance of spilling hot hydrocarbon on hands and of breaking graduates. Sampler lid keeps water out of sampler during rainy weather. Sampler construction was suggested for the Philtex plant by Everett W. Jenkins, Phillips Petroleum Co., Phillips, Tex.

Sample bomb storing

STORING of sample bombs can be a simple task with the use of frames welded from scrap pieces of pipe.

One type is made by first making up two A-frames. The frames are then connected by short lengths of pipe as shown in the photo (right).

Short lengths of reinforcing rod are welded to the outer side of each A-frame. These rods are then placed upon the rack so that the necks of the bombs are supported by these rods.



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JOB IMPROVEMENT FOR THE PROCESS FOREMAN—12

How Design Variations Affect Exchanger Maintenance

Q. How does the design of removable exchangers vary?

A. Several variations in the design of removable-bundle exchangers are used. Each of these variations has certain advantages. Some save in first cost and others in maintenance. Some are dictated by service requirements. For the most part, these variations are in the design of the tube bundle. The designs covered here are pull-through floating heads, splitring floating heads, U-tube bundles, and pillbox channels.

Fig. 1a (June 6, page 138) shows the pull-through floating-head construction. The floating head bolts to a tube sheet of the same diameter. Fig. 1b (June 13, page 253) shows the splitring construction. The floating head bolts to a splitring that fits against the back of the floating-head tube sheet. The floating-head and splitring are larger in diameter than the shell.

The diameter of the shell cover is large enough to fit over the floating-head assembly. This construction allows more tube surface in a given shell diameter than a pull-through floating head. Thus the first cost per square foot of surface is less, but maintenance costs are higher.

Q. How does maintenance vary with different tube-bundle designs?

A. The pull-through floating-head tube bundle can be removed from the shell without taking off the shell cover or the floating head. But before the splitring bundle can be pulled, the shell cover, the floating-head, and the splitring must be unbolted and removed.

After a tube bundle is cleaned and repaired, it should be tested for leaks before it is reinstalled in the shell. The floating head is bolted in place and the test pressure is applied. The pull-through tube bundle is then installed in the shell and is ready to operate.

But before the splitring bundle is ready to operate, several additional steps are necessary. The floating head must be removed in order to insert the bundle in the shell. After the bundle is in place, the floating head is again bolted to the splitring. Another tube-side test is necessary to determine if the reassembled floating-head joint is tight. Then the shell cover is bolted in place. Every time a joint is unbolted, it costs money. And there is the risk of damaging the gasket, gasket face, or bolts. So pull-through construction is preferred by most maintenance men.

Q. How about U-tube design? What does it offer? What are its limitations?

A. The tubes in a U-tube bundle are bent in the shape of hairpins. The U-bends eliminate the need for a floating-head tube sheet. The channel tube sheet is about 25 per cent thicker than on a floating-head bundle because it does not benefit from the staying action of a floating-head tube sheet. The shell cover is welded to the shell. A U-tube bundle costs less than a splitring bundle of the same diameter and has about the same surface.

U-tube construction should be avoided where the tube-side fluid is dirty or fouling. The inside of the tubes cannot be cleaned mechanically but can be cleaned chemically. U-tube construction eliminates the heavy floating head with large bolts in high-pressure service. And the U-tube eliminates the chance for a floating-head leak to contaminate one of the fluids.

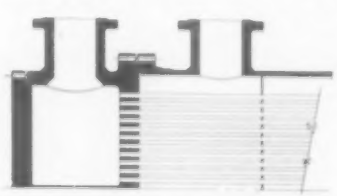


Fig. 9—Pill-box channel.

Q. What's a pill-box channel and why is it used?

A. Fig. 9 shows a pill-box channel. This type of channel is particularly well suited for high tube-side pressures, say over 600 psi. The channel barrel is integral with the tube sheet. Stud bolts in the end of the thick channel barrel hold the channel cover in place. The pill-box channel and the channel cover are usually forged steel. The pill-box channel combined with a U-tube bundle eliminates the need for any through-bolted flanges on the tube side.

Fabrication . . . Design goes hand in hand with fabrication in the building of a good heat exchanger. Little is accomplished with a first-class design if the fabrication is not of equal quality. True, a certain degree of quality is guaranteed by the pressure-vessel codes. But these codes are written primarily for columns and tanks, not for heat exchangers. And many of the important points in the fabrication of exchangers are not even mentioned.

The fabricator of heat exchangers should be familiar with problems and needs that arise during field construction. He should have a thorough knowledge of maintenance facilities and difficulties. And he must know how fabricating techniques and practices can affect the performance of the exchanger.

The next installment will feature a few specific points that are important in building heat exchangers.

This material is from a paper, "Design Features in Heat Exchangers," by W. E. Glausser and J. A. Cortright, C. F. Braun & Co., Alhambra, Calif. Paper presented at annual meeting, A.S.M.E., New York.

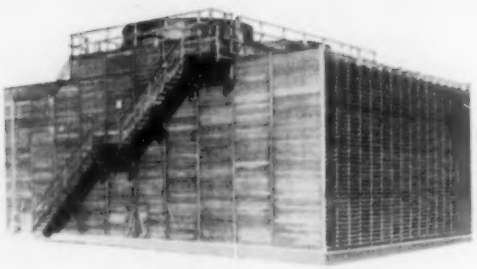
NOW

is the time to TEST Your Tower!

IF a water cooling tower has been installed in your plant in the past year, now is the time to find out whether the tower you own is the one you specified and paid for. This is the ideal time for a PERFORMANCE TEST. Your tower now should be operating at peak efficiency with all elements well co-ordinated. Of greater importance, ***this is the season when actual operating conditions most closely parallel conditions specified in your purchase contract.***

During summer months tower tests may be conducted at or near specified wet bulb temperatures, which means fewer variables, fewer calculations . . . it means the most accurate tests possible to obtain.

Since analysis of the results of a series of carefully conducted tests is the only method



of arriving at proof of the performance your tower is delivering, the manufacturer will be glad to assist in verifying the integrity of his product. He will welcome the opportunity to provide the necessary technical assistance that will enable you to conduct conclusive tests.

If you are not one of the 5000 engineers, operators and owners who requested copies of "Test Your Tower," the Marley brochure that explains a simple direct method of testing cooling towers, write for a copy today.

MARLEY

The Marley Company

Founder Member Cooling Tower Institute 222 West Gregory Blvd. Kansas City, Missouri

by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

Petrochemical Feed Stocks and Products

What are the main petrochemical products and what are the petroleum stocks from which they are made?—S.V.G.

There are such an enormous number of chemical intermediates as well as final products or chemicals that an answer cannot be given without many decisions as to how classifications should be made. However, the Report of the President's Materials Policy Commission, Vol. IV, June 1952, helps with some of these decisions and this report was used extensively in assembling Table 1. The amount of natural gas and petroleum stocks required are estimated for the year 1955 to be:

	Millions pounds	Other units
Natural gas:		M.c.f.
For ethylene (from ethane)	1,510	*24.9 × 10⁶
For other products	4,830	*61.0 × 10⁶
		85,900,000
Petroleum liquids (various):		B.p.d.
For ethylene	2,000	†18,350
For propylene	1,640	†15,050
For butylenes and butanes	2,270	†20,800
For pentenes, pentanes and higher	540	†4,950
For aromatics	6,130	†56,200
Total	18,950	115,350

*Assuming 30 molecular weight gas is consumed. †Based on an average naphtha gravity of 54° A.P.I. and 365 days per year.

TABLE 1—MAIN PETROCHEMICAL PRODUCTS AND INTERMEDIATE HYDROCARBONS

Principal source—
Natural gas:
- *Acetic acid
- Acetylene
- Ammonia
- Chloroethane
- Hydrogen cyanide
- Methanol
- Methyl chloride
- Methylene chloride
- Nitroparaffins

Naphthas† (light gas oil) or Ethane† or gases (cracking still):
- Ethylene:
  - Ethanol
  - ‡Ethylacetate
  - Ethyl chloride
  - Ethylene dichloride
  - Ethylene dibromide
  - §Ethylene oxide
  - Ethylene glycol
  - Polyethylene
  - Vinyl chloride
- Ethylene (benzene):
  - Styrene

Naphthas,† straightrun:
- Cyclopentadiene
- Butadiene
- Isoprene
- Aromatics

Naphthas, straightrun:
- Benzene
- Cyclohexane
- Naphthalene
- ¶Naphthenic acids
- Toluene
- Xylenes

Gas oil or cracking stocks:
- Aromatics

n-Butylene:
- Butadiene
- sec-Butyl alcohol

i-Butylene:
- Butyl rubber

Propylene:
- Glycerin
- Polypropylene
- Isopropanol

Propylene (benzene):
- Cumene

Cracked naphtha:
- Amyl alcohol
- Cresols and cresylic acid

*Excluding acid made from ethanol. †Severe or high-temperature thermal cracking. ‡Some also made from ethanol. §Primary product not used from ethylene glycol. ¶Certain crude oils.

The petroleum liquids consumed for chemicals amounts to about 1.8 per cent of our total demand for crude oil, and the gas consumed for chemicals will amount to about 9.6 per cent of the total gas marketed. By 1975, the total production of petrochemicals is expected to increase nearly threefold, and most authorities feel that the estimate is conservative.

The final end-products were grouped by the president's committee as follows:

Synthetic fibers.—Nylon, Dacron, acrylic, other synthetics, and cellulosics (acetate rayon).

Synthetic rubbers.—Buna-S types, butyl, neoprene, and nitrile (buna-N).

Plastics, resins, and plasticizers.—Polyethylene, alkyds, vinyls, polystyrene, phenolics (urea and melamine), cellulosics, and others.

Protective coatings (including solvents).—Aromatics, alcohols, ketones, glycerin, and others.

Automotive chemicals.—Tetraethyl lead fluid and other additives, antifreezes, and hydraulic fluids.

Nitrogen products (including fertilizer), detergents, and miscellaneous items.—Insecticides, herbicides, dyes, and miscellaneous solvents.

Significance of Sulfur in Residual Fuel Oil

What harm arises from sulfur in Bunker C fuel oil? Does sulfur greatly reduce its heating value?—S.P.R.

The sulfur compounds in residual fuel are usually not corrosive and hence the objections to sulfur stem from the sulfur dioxide content of the flue gas from high-sulfur fuels, or to the lower heating value of high-sulfur fuels.

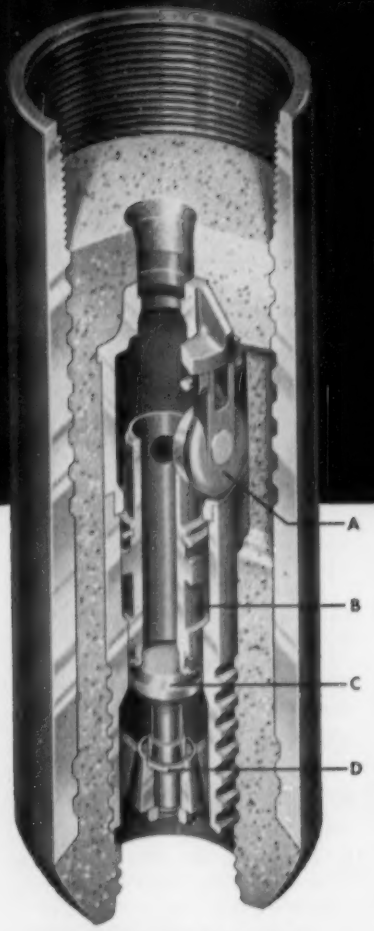
Fuel oil that is used in reducing iron ore, or in melting iron or steel must be low in sulfur because sulfur greatly harms steel. The sulfur content must be at least as low as 1 per cent and a special price of 5-15 cents per barrel is paid for such low-sulfur fuel oils. Metallurgical coke must also contain less than 1 per cent of sulfur.

The heating value of sulfur is only about 4,050 B.t.u. per pound whereas the heating value of the hydrocarbon mixtures composing residual fuel oil ranges from 18,300-18,700 B.t.u. per pound. Accordingly, 1 per cent of sulfur reduces the heating value by about 0.8 per cent.

Finally, the flue gases produced by the combustion of a fuel contain water vapor, and if these gases are cooled to a low enough temperature they become corrosive and in the extreme, condensation of moisture occurs. The temperature to which the gases can be cooled in boiler economizers or air preheaters ranges from about 250° F. for low-sulfur fuels to about 450° F. for very high-sulfur fuels. Metal tube wall temperatures were stated in the Questions on Technology of December 22, 1952, page 353, as a function of percentage of sulfur, kind of fuel, and manner of firing. Inasmuch as higher flue gas or stack temperatures mean lower boiler efficiencies, an increase of 1 per cent in the sulfur content reduces the thermal efficiency of a boiler by about ½ per cent. This does not apply, of course, to furnaces that operate at stack temperatures exceeding about 450° F.

FILL YOUR CASING AUTOMATICALLY

...from the bottom...while it's being run



Baker DIFFERENTIAL FILL-UP Shoe, Product No. 1081.

A—Flapper Valve functions only at discretion of operator.
B—Sleeve Valve operates to control rate of flow and volume of "fill-up" fluid.
C—Sleeve Valve Seat.
D—Shear Ring is sheared. Flapper Valve now functions for floating or cementing.

with BAKER

- **DIFFERENTIAL FILL-UP SHOES** *and*
- **DIFFERENTIAL FILL-UP COLLARS**

Here's what DIFFERENTIAL FILL-UP Equipment does . . .

Permits the casing to fill automatically from the bottom, while it is being run, to within 90% of the fluid level of the annulus (using a shoe OR a collar)—or to within 81% of the fluid level of the annulus (using both a shoe AND a collar). In addition, a back-pressure valve is present to be used at the discretion of the operator, for "floating" or for cementing.

Here's how Baker DIFFERENTIAL FILL-UP Equipment will aid you to avoid danger, increase rig efficiency, save valuable time and promote safety...

REDUCES THE DANGEROUS "RAM EFFECT" thus minimizing the hazard of breaking down a potential lost circulation zone.

SAVES COSTLY DRILLING MUD that might otherwise be lost to the formation due to the "ram effect."

MINIMIZES DAMAGE TO MUD CAKE on the wall of the hole. The majority of the fluid displaced as the casing string is lowered enters the casing instead of flowing up the annulus and causing possible damage to the mud cake.

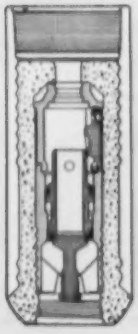
REDUCES DANGER OF STICKING CASING by reducing to a minimum the "no-motion time" formerly required to fill casing at the surface—extremely important when running casing in directional holes or sloughing formations.

SAVES ONE-HALF THE RUNNING-IN TIME plus the proven advantages of Baker Floating Equipment, including a back-pressure valve for cementing.

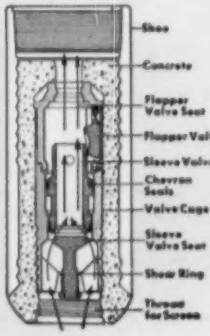
KEEPS THE RIG FLOOR CLEAN AND SAFE by eliminating the messy spill-over and splattering of mud present when casing is filled at the surface.

Ask any Baker representative or office for this new 16-page illustrated brochure . . .

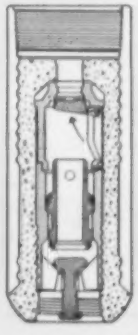
BAKER OIL TOOLS, INC., HOUSTON · LOS ANGELES · NEW YORK



When running-in, the Sleeve Valve is in closed position in contact with the Sleeve Valve Seat. When the Sleeve Valve is in this position, fluid entry into the casing from below the valve is effectively blocked. The Sleeve Valve will be in the closed position whenever the height of the fluid column in the casing (the fill) EXCEEDS 90% of the height of the fluid column in the annulus.



When the height of the fluid column in the casing (the fill) is LESS than 90% of the height of the fluid column in the annulus, the Sleeve Valve moves upward away from the Seat and permits fluid entry into the casing through the bottom of the FILL-UP Shoe. During the casing run, the Sleeve Valve opens and closes according to the pressures imposed on its top and bottom areas and thus automatically regulates the degree of fill.



When it is time for cementing, pressure of approximately 1,000 psi is built up in the casing to shear the Shear Ring that holds the Sleeve Valve Seat in the supporting vanes of the Valve Cage. The Sleeve Valve can then move downward sufficiently to release the spring-loaded Flapper Valve, and thereafter the FILL-UP Shoe functions as a conventional Float Shoe.

CHEMICAL SURFACTANTS—2

How Interfacial Tension Affects Oil Displacement

by C. E. Clason

BARTELL of the University of Michigan constructed a glass cell in which a preferentially water-wet sand was saturated with oil. When water came in contact with the sand, the water-oil interface in the sand was such that a greater pressure existed on the oil side than on the water side owing to the concave shape of the oil interface.

Restoration of equilibrium displaced the oil to a given height above the previous level in a small tube extension, and this height could be translated into dynes of capillary pressure. The profile of the interface or angles could also be distinguished and measured. A value could thus be established for spontaneous capillary displacement pressure or pressure necessary to start movement in displacing oil by the water (Fig. 3).

No work has been done with treated brine or water in this type of cell, but the influence can readily be deducted. Lowering the surface tension to air also lowers the interfacial tension (I.T.) between oil and water. The angle of contact will be higher because of less concavity, denoting less pressure. When measurements show a reduction of I.T. from 24 to 0.5 dynes, it should lower P almost in exact proportion or to 1/48 as much depending on the cosine value of the angle by comparison. From 45° to 90° = 0.7071 to 1.0.

The next consideration is just what this becomes in terms of necessary pressure to start movement. It can readily be shown that it means very little even in small capillaries. To start movement from one of 0.0001 cm. (0.000004 in.) radius into a 0.00001 cm. (0.0000004 in.) of 1/10 the size would require only 27 psi. pressure as shown—

Contact angle 45° — Cos = 0.7071

oTw = 24 dynes

Then P in dynes

$$= 0.7071 \times 24 \times \left(\frac{1}{.0001} + \frac{1}{.00001}\right)$$

$$= 17 \times (10{,}000 + 100{,}000)$$

$$= 17 \times 110{,}000$$

or 1,870,000 dynes

1 dyne = 1.45×10^{-5} lb./in.²

$$1{,}870{,}000 \times 1.45 \times 10^{-5} = 27.1 \text{ lb./in.}^2$$

If the I.T. was reduced to 0.5, then 1/48 of 27.1 = 0.56 psi. needed instead of 27.1 psi. This might be of importance in a very low-pressure formation. The presence of gas bubbles could add to pressure required for movement, depending upon quantity, and this is relieved by reduction of film strength. Both could be of value in water-blocked low-pressure zones.

We know that once movement is established, it is easier for formation oil to carry and remove water that has its film strength reduced. The permeability of the formation to oil is increased considerably.

However, considering the low pressures and channel size ranges involved,* it would appear that large increases in production may be more from other reasons such as breaking the thicker water-oil emulsions that can be present. These affect far larger capillaries, and both flowing pressure and volume are in direct proportion to reduction in viscosity.

The ability of a surfactant to **not** form an emulsion and to break all those encountered can readily be a greater reason for success than the low-pressure phenomena of film strengths alone.

Author is with Halliburton Oil-Well Cementing Co.

*0.001 cm. to 0.0001 cm. = 2.7 lb./in.²
0.01 cm. to 0.001 cm. = 0.27 lb./in.²
There is no reason to speculate as to the number of restrictions present because the formation is aimed to be adsorptionally treated so that all are affected proportionally under conditions of return flow to the well bore.

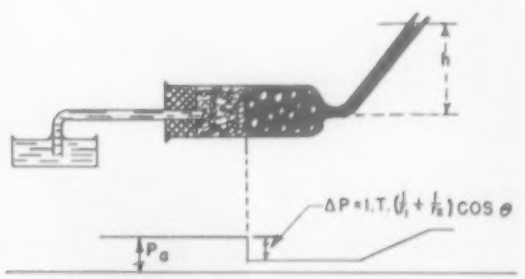


Fig. 3—A Bartell cell, illustrating capillary drive and pressure in a porous medium.

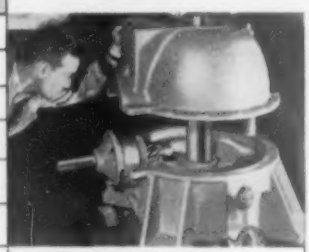
FLUOR -WESTERN SPEED REDUCERS

add years to the mechanical life of cooling towers

Gear reducers which drive the fans in induced draft cooling tower service are located in the exhaust stream and are constantly exposed to the hot, humid and often corrosive vapors coming up through the tower. Gear boxes must be specially designed to withstand corrosion, and operate efficiently and economically for the life of the tower. The built-in superiority of the Fluor-Western power transmission unit is shown in the chart below. The Fluor unit is compared with five competing makes:

The bell-shaped housing on Fluor-Western Speed Reducers is low, wide, and offers a good sturdy support for fan.

	FLUOR	A	B	C	D	E
1. Case-hardened spiral gear	yes	yes	yes	yes	no	yes
2. Ratings based on 1.5 AMGA service factor	yes	no	yes	yes	no	yes
3. Straddle mounted pinion gear	yes	no	no	yes	yes	no
4. Webless-type ring gear	yes	yes	no	yes	no	yes
5. B-10 bearing life (in hours)	80,000 to 2,000,000	50,000	20,000	80,000 to 100,000		5,000
6. Condensate trap	yes	no	yes	yes	no	yes
7. Double neoprene seals (input shaft)	yes	no	no	no	no	no
8. Two oil-fill elbows	yes	no	no	no	no	no
9. Efficiency	98%	98%	98%	98%	90-95%	98%



Each Fluor-Western Speed Reducer is thoroughly tested for noise level and horsepower rating before leaving the factory.

EXPLANATION OF CHART

1. Over the years, case-hardened spiral bevel gears have proved to be far superior to worm gears or flame-hardened bevel gears.

2. The Fluor-Western Speed Reducer is designed and rated in accordance with the applicable standards of the American Gear Manufacturers' Assn. and utilizes a minimum service factor of 1.5 for continuous service.

3. The Fluor-Western pinion is straddle-mounted on heavy-duty bearings. Uniform tooth contact, quieter operation, minimum deflection are the advantages.

4. Deflection tests on ring gears prove conclusively that webless ring gears which utilize a maximum diameter hub are much more rigid than web-mounted gears.

5. Most gear failures are traced to bearing failure. The majority of bearings in the Fluor-Western Speed Reducer have a B-10 life in excess of 100,000 hours. At certain ratios and speeds bearing life can be considered infinite.

6. A condensate trap collects entrained water inside the gear unit caused by condensation, thus protecting the lower bearing from improper lubrication.

7. Two Neoprene seals mounted back to back on the input shaft, with grease between (to keep foreign matter out and oil in), are found only on the Fluor-Western unit.

8. Only Fluor-Western units have the servicing convenience of two oil-fill elbows; one is piped outside the fan stack for easy filling, the other provides a positive check for proper oil level.

9. Efficiency ratings are based on actual gear mesh loss. Fluor-Western spiral bevel gears average around 1% to 2% loss while competitive worm gears show a loss of 5% or greater.

A COOLING TOWER EVERY 3 DAYS

In the past decade (1944 through 1954) Fluor has built 1,218 induced draft cooling towers throughout the world—**an average of one new tower every three days.** The total number of cells in these towers adds up to 3,138 which represents 3,138 individual gear reducers ranging in sizes from 15 to 100 horsepower ratings. The extra long gear and bearing life of Fluor-Western Speed Reducers is an important factor in the overwhelming preference for Fluor Cooling Towers. The Bulletin, "Cooling Water for Industry," will be mailed on request.

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VACUUM-FLASH VAPORIZATION—2

What's Needed to Estimate Degree of Vaporization

by G. A. Filak, H. L. Sandlin, and C. J. Stockholm

REFINERY vacuum towers on which tests were conducted and the laboratory distillations used were described in the first installment. Table 1, given here, includes the data on the charge stocks, experimental conditions, and other data relating to plant tests and the laboratory distillation results.

4. Basic Correlations

Okamoto and Van Winkle . . . These investigators correlated A.S.T.M. distillation temperature, per cent flashed, flashing pressure, and flashing temperature. This correlation was derived from experimental laboratory flash vaporizations made on several stocks at pressures below atmospheric.

True boiling point . . . In an earlier method, the same investigators have correlated true boiling 50 per cent point, flashing pressure, and flash-vaporization 50 per cent point. A second nomogram of true-boiling-point distillation slope, flashing pressure, and flash-vaporization slope is used together with the 50 per cent point correlation to obtain an estimate of the flash vaporization at any pressure. These slopes and 50 per cent point relationships are based on a theoretical analysis of hypothetical crude oils made by blending pure hydrocarbons to simulate actual crude oils.

Nelson and Harvey . . . They also plot A.S.T.M. distillation 50 per cent point versus flash-vaporization 50 per cent point, and A.S.T.M. distillation slope versus flash-vaporization slope. These relations are derived from experimental work at atmospheric pressure, and flash-vaporization curves are reduced to low pressures using vapor-pressure curves for normal paraffin hydrocarbons.[6] Nelson and Harvey assume constant slope for the flash vaporization curve throughout all pressure ranges.

TABLE 1—TEST DATA

Test Unit B

Flashing conditions:	
Pressure,* mm. Hg abs.	120
Temperature, °F.	736
Steam to flash chamber	None
Overhead, bbl. per day	4,002
Bottoms, bbl. per day	1,428
Volume flashed, per cent	74
Reduced crude charge (mixed base-1):	
Gravity, °A.P.I.	29.3
Viscosity at 210° F., S.U.s.	53
Conradson carbon residue, wt. per cent	1.15
Sulfur, wt. per cent	0.17
Cleveland open-cup flash point, °F.	260

Vacuum distillation at 5 mm. Hg abs.

Per cent off	Vap. temp. at 5 mm. (°F.)	Gravity °A.P.I.	Aniline No. (°F.)	Refractive† index	Correlation‡ index
0-5	350	42.1	172.9	1.4283	
5-10	396	36.5	191.0	1.4426	19
10-15	416	34.7	197.6	1.4473	21
15-20	424	33.7	200.2	1.4496	22
20-25	436	32.9	205.8	1.4538	23
25-30	448	32.5	210.0	1.4548	23
30-35	462	32.2	211.3	1.4560	23
35-40	474	31.7	213.1	1.4572	23
40-45	488	31.2	215.6	1.4580	23
45-50	501	30.6	218.5	1.4590	24
50-55	518	30.1	221.7	1.4605	24
55-60	533	29.8	223.9	1.4623	24
60-65	548	29.2	226.8	1.4640	24
65-70	572	28.7	230.4	1.4663	25
70-75	585	28.1	231.4	1.4686	25
75-80	612	27.4	235.4	1.4708	25
80-85	628	26.5	237.9	1.4732	27
85-87.5	650	26.1	240.1	1.4753	28
12.5% bottoms		21.6			

*Includes correction for steam. †Temperature = 170° F. ‡See bibliography.

Test Unit C

Flashing conditions:	
Pressure,* mm. Hg abs.	38
Temperature, °F.	725
Steam to flash chamber, lb. per hr.	3,600
Overhead, bbl. per day	2,730
Bottoms, bbl. per day	1,170
Volume flashed, per cent	70
Reduced crude charge (asphalt base):	
Gravity, °A.P.I.	20.1
Viscosity at 210° F., S.U.s.	84
Conradson carbon residue, wt. per cent	2.20
Sulfur, wt. per cent	0.35
Cleveland open-cup flash point, °F.	270

Vacuum distillation at 5 mm. Hg abs.

Per cent off	Vap. temp. at 5 mm. (°F.)	Gravity °A.P.I.	Aniline No. (°F.)	Refractive index	Correlation index
0-5	269	29.5	120.0	1.4600	
5-10	326	25.9	127.8	1.4730	53
10-15	367	24.4	141.0	1.4780	52
15-20	406	23.1	150.8	1.4810	52
20-25	434	22.3	160.0	1.4840	52
25-30	458	21.7	167.4	1.4855	52
30-35	475	21.3	172.4	1.4870	51
35-40	492	20.8	177.4	1.4885	52
40-45	510	20.5	180.0	1.4900	51
45-50	525	20.3	184.6	1.4910	51
50-55	535	19.8	187.2	1.4920	51
55-60	555	19.7	190.0	1.4925	51
60-65	569	20.2	196.0	1.4915	49
65-70	595	20.4	200.6	1.4920	47
70-75	616	20.6	205.6	1.4915	44
25% bottoms		15.3			

*Includes correction for steam.

Authors are with the technical department, refining division, Magnolia Petroleum Co., Beaumont, Tex. Paper presented at second annual joint A.I.Ch.E.-A.C.S. meeting, Sabine area and Texas-Louisiana Gulf chapters, respectively.

Test Unit C

Flashing conditions:	
Pressure,* mm. Hg abs.	35
Temperature, °F.	753
Steam to flash chamber, lb. per hr.	4,250
Overhead, bbl. per day	2,568
Bottoms, bbl. per day	832
Volume flashed, per cent	76
Reduced crude charge (mixed base-2):	
Gravity, °A.P.I.	24.1
Viscosity at 210° F., S.U.s.	60
Conradson carbon residue, wt. per cent	4.14
Sulfur, wt. per cent	0.57
Cleveland open-cup flash point, °F.	220

Vacuum distillation at 5 mm. Hg abs.

Per cent off	Vap. temp. at 5 mm. (°F.)	Gravity °A.P.I.	Aniline No. (°F.)	Refractive index	Correlation index
0-5	290	39.1	141.4	1.4400	
5-10	332	34.4	161.4	1.4530	29
10-15	362	32.4	171.6	1.4585	31
15-20	378	31.3	177.6	1.4630	32
20-25	410	30.3	182.4	1.4660	32
25-30	425	29.8	187.2	1.4660	32
30-35	442	28.9	191.4	1.4695	33
35-40	457	28.4	194.6	1.4710	33
40-45	478	27.6	198.4	1.4735	34
45-50	500	26.9	202.2	1.4750	34
50-55	522	26.0	205.6	1.4780	35
55-60	548	25.1	209.6	1.4810	35
60-65	572	24.8	211.6	1.4835	35
65-70	594	23.7	214.6	1.4865	37
70-75	632	23.2	213.0	1.4905	37
25% bottoms		13.4			

*Includes correction for steam.

Test Unit A

Flashing conditions:	
Pressure, mm. Hg abs	127
Temperature, °F.	747
Steam to flash chamber, lb. per hr.	270
Overhead, bbl. per day	3,488
Bottoms, bbl. per day	4,712
Volume flashed, per cent	43
Reduced crude charge (mixed base-3):	
Gravity, °A.P.I.	24.5
Viscosity at 210° F., S.U.s.	82
Conradson carbon residue, wt. per cent	3.85
Sulfur, wt. per cent	0.74
Cleveland open-cup flash point, °F.	350

Vacuum distillation at 5 mm. Hg abs.

Per cent off	Vap. temp. at 5 mm. (°F.)	Gravity °A.P.I.	Aniline No. (°F.)	Refractive index	Correlation index
0-5	366	35.5	164.4	1.4470	
5-10	407	32.3	181.2	1.4545	28
10-15	438	31.1	188.6	1.4598	28
15-20	456	30.3	193.8	1.4625	28
20-25	478	29.6	198.8	1.4620	28
25-30	495	28.9	203.4	1.4665	29
30-35	515	28.4	205.8	1.4670	29
35-40	532	27.9	209.8	1.4700	29
40-45	552	27.2	213.0	1.4712	30
45-50	570	26.6	215.6	1.4740	30
50-55	592	26.0	218.0	1.4755	31
55-60	608	25.6	219.0	1.4780	31
60-65	620	25.3	214.4	1.4790	31
65-70	648	25.0	213.0	1.4810	
30% bottoms		17.4			

*Includes correction for steam.

Test Unit A

Flashing conditions:	
Pressure,* mm. Hg abs.	113
Temperature, °F.	743
Steam to flash chamber, lb. per hr.	550
Overhead, bbl. per day	5,435
Bottoms, bbl. per day	3,905
Volume flashed, per cent	58
Reduced crude charge (mixed base-2):	
Gravity, °A.P.I.	22.5
Viscosity at 210° F., S.U.s.	74
Conradson carbon residue, wt. per cent	3.68
Sulfur, wt. per cent	0.54
Cleveland open-cup flash point, °F.	355

Vacuum distillation at 5 mm. Hg abs.

Per cent off	Vap. temp. at 5 mm. (°F.)	Gravity °A.P.I.	Aniline No. (°F.)	Refractive index	Correlation index
0-5	360	33.3	159.4	1.4555	
5-10	391	31.0	175.0	1.4650	32
10-15	415	30.1	181.6	1.4660	32
15-20	432	29.5	186.0	1.4680	32
20-25	448	28.9	192.0	1.4700	33
25-30	464	28.4	193.4	1.4700	33
30-35	484	27.8	198.8	1.4730	33
35-40	498	27.0	202.4	1.4750	34
40-45	520	26.4	204.4	1.4775	34
45-50	538	25.7	207.6	1.4800	35
50-55	558	25.0	210.0	1.4820	35
55-60	580	24.4	212.0	1.4840	36
60-65	604	23.9	215.2	1.4870	36
65-70	634	22.6	217.0	1.4900	38
70-72.5	650	21.5	217.6	1.4930	40
27.5% bottoms		12.9			

*Includes correction for steam.

Test Unit A

Flashing conditions:	
Pressure,* mm. Hg abs.	90
Temperature, °F.	747
Steam to flash chamber, lb. per hr.	360
Overhead, bbl. per day	3,800
Bottoms, bbl. per day	4,190
Volume flashed, per cent	48
Reduced crude charge (mixed base-4):	
Gravity, °A.P.I.	22.4
Viscosity at 210° F., S.U.s.	84
Conradson carbon residue, wt. per cent	3.98
Sulfur, wt. per cent	0.84
Cleveland open-cup flash point, °F.	360

Vacuum distillation at 5 mm. Hg abs.

Per cent off	Vap. temp. at 5 mm. (°F.)	Gravity °A.P.I.	Aniline No. (°F.)	Refractive index	Correlation index
0-5	364	35.1	162.2	1.4470	
5-10	406	30.7	178.0	1.4616	32
10-15	431	29.3	181.8	1.4663	33
15-20	452	28.5	189.4	1.4686	33
20-25	470	28.1	193.2	1.4698	33
25-30	488	27.4	197.4	1.4718	34
30-35	500	26.9	200.0	1.4725	34
35-40	518	26.3	204.0	1.4750	34
40-45	531	25.6	204.6	1.4755	35
45-50	554	25.2	207.6	1.4790	35
50-55	568	24.7	208.8	1.4823	36
55-60	595	24.2	211.4	1.4848	35
60-65	616	23.5	211.4	1.4846	36
65-70	634	23.1	208.0	1.4862	36
70-75	650	22.7	204.6	1.4835	37
25% bottoms		13.1			

*Includes correction for steam.

Pipeline Patrol

. . . Report on Construction

Under Way, Contracted, and Planned

PIPELINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipeline companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by • preceding the job.

Crude-Oil Pipelines

• **Big Horn Pipe Line Co.**—Firm has asked Wyoming Public Service Commission for permission to build a 150-mile, 8-in. crude-oil line from Ash Creek field, Wyoming, to a connection with Service Pipe Line Co.'s line at Midwest, Wyo.

Butte Pipe Line Co.—This jointly owned company of Shell Oil Co., Murphy Corp., and Northern Pacific Railroad has let contracts for its $18,000,000 crude-oil line from southeastern Montana to Guernsey, Wyo. Contractors and their spreads are:

Anderson Brothers Corp., Houston, 82 miles of 10-in. and 6½ miles of 12-in. from Glendive to Poplar, Mont.

Associated Pipe Line Contractors, Houston, sections 1 and 2, totalling 227 miles of 16-in. from the Montana-Wyoming state line to Guernsey.

O. R. Burden Construction Corp., Tulsa, 88 miles of 16-in. from Alzada, Mont., to Cabin Creek field near Baker. Company also has 15 miles of 12-in. in this area.

Art Hartwig, Inc.—Company will build and operate a 78-mile, 6-in. crude line from Sumatra field of central Montana to the Billings-Laurel refining area. The project will cost about $1,000,000 and will be finished by fall.

Interstate Oil Pipe Line Co.—Company has let contract to Sam Carline, Inc., of Berwick, La., to build 13 miles of 16-in. crude-oil line in the Raceland, La., district. Most of the line will be in Lafourche Parish. Completion is set for August 1.

• **Malco Pipeline, Inc.**—Company is planning a 40-mile, 4-in. line from South Blanco Tocito field in Rio Arriba County, New Mexico, to Bloomfield, San Juan County, New Mexico. Completion set for 1955.

Mid-Continent Pipe Line Co.—Company has let contract for 24 miles of 8-in. line from Hominy to Sand Springs, Okla. Trojan Construction Co., of Oklahoma City, is doing the work. Completion set for last of July.

• **Stanmount Pipeline Co.**—Company is seeking permission to build a crude-oil line from fields in North Dakota to Cromer, Man., where it would hook up with the Interprovincial line. The line would cost $6,000,000. Size not known.

Trans Mountain Pipe Line Co.—Engineers Limited Pipeline Co. has contract to lay 27 miles of 20-in. from Laurel to Burlington, Wash., and 9 miles of 16-in. of lateral to Shell Oil Co.'s new refinery at Anacortes, Wash. The $2,750,000 job will begin in spring and end July 31.

• **Union Oil Co. of California.**—Company proposes to build an 815-mile line from Rifle, Colo., to Los Angeles to carry the products from its proposed Rifle, Colo., shale-oil plant to the Los Angeles refining area. The line would cost approximately $56,000,000.

• **West Coast Pipeline Co.**—The off-again-on-again plans for this crude line from near Wink in West Texas to near Norwalk in California are presently before the Office of Defense Mobilization. A three-man board of nonindustry members recently recommended that the project be dropped. They questioned the ability of West Texas to produce enough crude to supply both the East and West Coasts in time of war. The three-man board favored building a line from California's Elk Hills Naval Reserve to be held in standby for possible future need.

Products Pipelines

• **American Pipe Line Co.**—Has received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line to run from Gulf Coast area to New York City area. Bids for pipe requested.

• **H. W. Bass & Sons, Inc.**—Company is planning on a 152-mile, 4-6-in. L.P.G. line from Goliad Corp.'s plant in Live Oak County, Texas, to Corpus Christi.

• **California - Oregon Pipe Line System.**—103 miles 6-in., proposed, Crescent City, Calif., to Medford, Ore.

Champlin Refining Co.—River Construction Co. is laying 50 miles of 6-in. from the company's Enid, Okla., refinery to Ponca City, Okla. Job expected to be completed by August 1.

Great Lakes Pipe Line Co.—Company will let contract soon for 106 miles of 12-in. line between Des Moines and Iowa City, Iowa. The line will be finished by fall and will parallel existing 6 and 8-in. lines.

Southern Pacific Pipe Lines, Inc.—Company has completed letting most of the contracts for its 846-mile products line from Los Angeles into Phoenix and El Paso into Phoenix. The contractors are:

. . . Schedule 1—158 miles of 8-in. between El Paso and Lordsburg, N. M., under construction by Morrison-Knudsen Co., Los Angeles, and River Construction Co., Fort Worth.

. . . Schedule 2—145 miles of 8-in. between Lordsburg and Tucson under construction by R. H. Fulton & Co., Lubbock, Tex.

. . . Schedule 3—122 miles of 8-in. and 35 miles of 12-in. from Tucson to Hassayampa, Ariz., contracted by Hood Construction Co., Lynwood, Calif.

. . . Schedule 4—128 miles of 12-in. from Hassayampa to Yuma, Ariz., let to Macco Corp. and Alex Roberson Co., Paramount, Calif.

. . . Schedules 5 and 6—197 miles of 12-in. between Yuma and Colton, Calif., let to Conyes Construction Co., San Pablo, Calif.

. . . Schedules 7 and 8—61 miles of 16-in. between Colton and the Watson, Calif., refining area not awarded yet.

• **International Pipe Line, Inc.**—132 miles, 8-in., proposed, Wrenshall to Minneapolis, Minn. Cost: $4,200,000.

Moore Stoner Co.—Company has $2,500,000 tax amortization for a 200-mile, 6-in. products line from a connection with Oil Basin Pipe Line Co.'s terminal at Glendive, Mont., to Minot, N. D.

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Pipeline Patrol

Okan Pipe Line Co.—This subsidiary of Warren Petroleum Corp. has awarded work to two contractors for its L.P.G. line from western Oklahoma and Kansas to Tulsa. Vaughn & Taylor Construction Co. has 260 miles of 3 to 6-in. gathering lines, and R. H. Fulton has 140 miles of 6-in. transmission line from western Oklahoma into Tulsa.

Sioux Oil Co.—Company will build a 55-mile products, 8-in. line from its Newcastle, Wyo., refinery to Rapid City, S. D.

• **Sunflower Pipe Line System.**—Company proposes to build a 215-mile, 6-in. line to transport L.P.G. from six counties in western Kansas to Wichita. Application approved by Kansas Corporation Commission.

Texas Eastern Transmission Corp.—Company has received Federal Power Commission approval to abandon the "Little Inch" gas line and to convert it to products service. The company will spend $13,000,000 converting the line back to products. When finished the line will have a capacity of 235,000 bbl. daily.

Non-Petroleum Pipelines

American Gilsonite Co.—Company has announced plans for a 100-mile pipeline from near Bonanza, Utah, to a proposed gilsonite refinery in western Colorado. The company, owned by Barber Oil Corp. and Standard Oil Co. of California, plans to make gasoline and coke by refining gilsonite. The gilsonite would be moved in a slurry.

Pittsburgh Consolidation Coal Co.—This firm has announced plans for the first pipeline to move coal. The line will be 108 miles of 10-in. from the company's Georgetown mines in eastern Ohio to Cleveland Electric Illuminating Co.'s Eastlake power plant northeast of Cleveland. Construction will start this fall as soon as right-of-way can be procured. Ford, Bacon & Davis, Inc., will issue specifications, let contracts, and supervise the construction work.

Natural-Gas Pipelines

• **Alabama-Tennessee Natural Gas Co.**—Company has proposal before FPC to lay 21 miles of 12-in. line west from its present line in Colbert County, Alabama.

American Louisiana Pipe Line Co.—Company has let the bulk of its 1,121 miles of natural-gas line from North Tepetate, La., to Detroit. H. C. Price Co., Bartlesville, Okla., and Houston Contracting Co., Houston, were awarded 783 miles of 30-in. Brown & Root, Inc., Houston, was awarded approximately 221 miles of 30-in. from North Tepetate to the Arkansas-Louisiana border. The only section not awarded is a 22-in. spur from Payne, Ind., to Bridgman, Mich. Price will have two spreads in the field. One will work south from the Hancock-Henry county line in Indiana, the other will work north from Slaughters, Ky. Houston Contracting will also work two spreads. One will start working south from Detroit and the other north from the Hancock-Henry county line.

• **Arkansas Louisiana Gas Co.**—136 miles of new line proposed, to be added to present system in Arkansas, Louisiana, and Texas. Estimated cost: $9,245,166. FPC approved.

Atlantic Seaboard Corp.—Company has let 82 miles of 26-in. gas line in Virginia, West Virginia, and Maryland. Pipe Line Construction & Drilling Co., Lemoyne, Pa., has 32 miles in three sections. Williams-Austin Co., Pittsburgh, has 40 miles in West Virginia. Job set for completion the last of August.

• **Carolina Natural Gas Corp.**—185 miles 2-12-in., proposed lateral lines off Transcontinental in North and South Carolina.

• **Central Hudson Gas & Electric Corp.**—Company has filed application with FPC to construct 48 miles of 12-in. line from Albany to Kingston, N. Y. Line will be started and completed in 1955 if FPC approves.

• **Cities Service Gas Co.**—Company has applied to the Federal Power Commission for permission to build a 93-mile, 26-in. natural-gas line from Blackwell, Okla., to Independence, Kans. The company also proposes to build a 145-mile gathering system in Woods County, Oklahoma, and Barber County, Kansas. The two jobs will cost $8,422,400.

• **Coastal Transmission Co.**—Company plans to build 550 miles of 30-in. line from near McAllen in South Texas to near Baton Rouge (See Houston, Texas Gas & Oil Co.)

Colorado Interstate Gas Co.—Company has let first part of its 380-mile, 22-in. line from Rock Springs, Wyo., to Denver to Houston Contracting Co. The construction firm is working on 126 miles from near Laramie, Wyo., to Denver. The line will pick up its gas from Pacific Northwest at Rock Springs.

Colorado Interstate Gas Co.—Company is also spending $4,200,000 extending its gathering lines in the Panhandle of Texas, Oklahoma, and Kansas. Work will be done this summer.

• **Colorado-Western Pipe Line Co.**—454 miles of undetermined size pipe planned between Cortez in Montezuma County and Denver. Line would serve towns of Montrose, Gunnison, Salida, Fairplay, and South Platte, Colo. Estimated cost: $30,000,000. Company also plans 254 miles of laterals to service Colorado cities not now receiving natural gas.

328-mile line, proposed, to run from a point in La Plata County in southwestern Colorado over the Continental Divide along the eastern slope to serve Pueblo, Colorado Springs, and Denver. Estimated cost: $21,600,000.

East Ohio Gas Co.—Company has let contract to Williams Brothers Co. to lay 112

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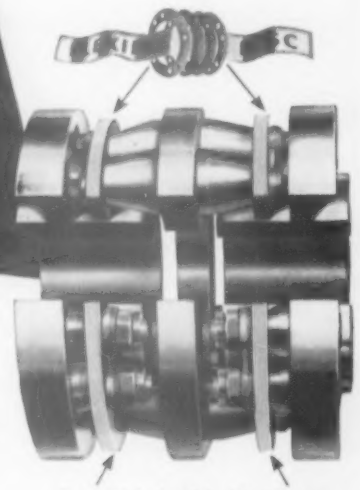

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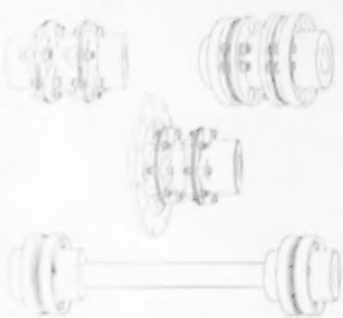

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Pipeline Patrol

miles of 30-in. from Maumee, Ohio, to Cleveland. Completion is set for October 1.

• **El Paso Natural Gas Co.**—Company has three plans ready to present to the FPC to increase its California capacity. The preferred plan calls for the company to loop its 500-mile, 30-in. line from the San Juan basin to the California border with a 34-in. line. If this fails to win approval, the firm will offer to build a 30-in. line from Pacific Northwest's line at Mountain Home, Idaho, to the San Francisco area. Another plan is to build a 30-in. line from near Pendleton, Ore., into California. Company feels the looping program will be required even if one of the alternate plans would win approval.

• **Houston, Texas Gas & Oil Co.**—Company plans to build 600 miles of 30-in., and 50 miles of 18-24-in. line to carry natural gas from Baton Rouge to Miami. Line will join with Coastal Transmission's proposed line from McAllen, Tex.

• **Kansas-Nebraska Natural Gas Co., Inc.**—Proposes to construct 206 miles of 6-12-in. pipeline to add to present system in central and northeastern Nebraska.

• **Lone Star Gas Co.**—Company has two plans up before FPC to enlarge its system in Texas and Oklahoma. One is for an $18,000,000, 230-mile line from Cotton County, Oklahoma, to Fritch, Tex. The other plan is for a 205-mile line from Snyder, Tex., to a hookup with the Cotton-Fritch line. The company hopes to prevent Natural Gas Pipeline Co. of America from building its line from Wise County, Texas, to Fritch (see below).

• **Michigan Consolidated Gas Co.**—25 miles, 12-in., proposed, from near Sparta to Muskegon, Mich.

Michigan Gas Storage Co.—Bechtel Corp. has contract to build 36 miles of 16-in. line from Mount Pleasant Junction to Milwaukee, Mich. The line will cost $2,500,000. Bechtel has set October 15 as completion date.

• **Michigan Wisconsin Pipe Line Co.**—251 miles, proposed, 24, 18, 12, 6, and 4-in loops. Majority will be in Wisconsin.

• **Natural Gas Pipeline Co. of America.**—Company now before FPC on plans to build 350 miles of 20 and 26-in. line from Wise County, East Texas, to its station 111 at Fritch, Tex.

• Company also plans to start 31 miles of 36-in. in July from Herscher, Ill., to a connection with Texas Illinois pipeline near Joliet, Ill. Job slated to be finished in November.

Natural Gas Producers, Inc.—Company has let contract to Houston Contracting Co. for 49 miles of natural-gas transmission line from northeastern Colorado to Denver, and 13 miles of distribution lines. The job will cost $1,374,000 and is expected to be completed in early July.

Nevada Natural Gas Co.—Company plans looping program along its 114-mile line from Needles, Calif., to Las Vegas, Nev. Mileage and size are unknown but cost will be about $2,500,000.

• **New River Gas Co.**—50 miles, planned. Summers to Monroe counties, West Virginia, to Narrows and Dublin, W. Va.

• **New York State Natural Gas Corp.**—Company has FPC permission to lay 21 miles of 20-in. line from Genesee Falls, Wyoming County, New York, to York, Livingston County, New York. FPC permission was received the last of June. Work should start in July and wind up in August.

• **Niagara Mohawk Power Corp.**—Company plans no major transmission lines for 1955. However, itp lans to add more than 300 miles of distribution mains.

• **Northern Natural Gas Co.**—Company has cancelled its 1955 construction program listed below until 1956 due to Trans-Canada Pipe Lines, Ltd., being delayed in starting its line. The program, which is now set for 1956, included:

• Canadian Extension—188 miles of 24-in. from Canadian border to near Wahpeton, N. D. 215 miles of 30-in. from Wahpeton to Farmington, Minn.

• South Dakota Extension—94 miles of 12-in. from Sioux Falls to Waterton-Huron. 71 miles of 10-in. from Waterton-Huron to Duluth-Superior.

• Duluth-Superior Extension—167 miles of 24-in. from Farmington to Duluth-Superior.

• Company has also asked FPC permission to build and operate $4,800,000 worth of pipeline facilities for use in testing an underground natural-gas storage field near Redfield, Iowa. The project would involve construction of 29 miles of 30-in. pipe.

Pacific Gas & Electric Co.—Company is working on 18 miles of 12-in. from Beehive Bend field to W/O Gridley in California. The job is slated for completion in September.

• Company plans 21 miles of 16-in. line from Marysville to Lincoln, Calif. Job will start in June and wind up in September.

• Company's long-range plans call for looping the Topock-Milpitas line with 135 miles of 34-in. The major part of the line will be laid in 1956, while 62 miles will be laid in 1957.

Pacific Northwest Pipe Line Corp.—Firm has let the initial contracts of its 1,466 miles gas line from the San Juan basin to Bellingham, Wash. The first contracts total $11,236,000. Contractors and their sections are:

River Construction Co., two sections totalling 150 miles of 26-in. between Ignacio, Colo., and Moab, Utah.

R. H. Fulton Co., two sections totalling

when the moon has pipelines
they'll be cleaned with . . .
WILLIAMSON WCK-12 PIGS
They're "out of this world"
already — according to
pipeliners who use them.
THEY'RE NOTED FOR:
• SIMPLICITY OF DESIGN
• DEPENDABILITY OF
PERFORMANCE
in all kinds of lines 6" through 14" sizes
T.D. Williamson, Inc.
THE PIG WITH THE POKE
CLEANS PIPE LINES
P O BOX 4038
TULSA 9, OKLAHOMA
REPRESENTATIVES (with their feet firmly on the earth)
Houston • Pittsburgh • Kenilworth, N. J. • Amarillo • Casper • Provo, Utah • Joliet, Illinois
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A pencil pokes through this corroded metal! Why chance trouble like this? Cathodic Protection and ANACONDA Type CP Cable effectively check corrosion of buried metals.

For longer cable life in cathodic protection —Anaconda Type CP Cable

Moisture, soil acids and alkalies, and —most important—oil are tough on present cables used in Cathodic Protection.

Anaconda's new Type CP Cable is specially designed—with double covering of polyethylene and Densheath* (PVC) — to resist these enemies of cable life. This means less frequent replacement . . . major savings in both labor and material costs.

*Reg. U. S. Pat. Off.

Polyethylene and Densheath used in ANACONDA CP Cable are inherently resistant to oil. And they have high resistance to electro-endosmosis, as well as to moisture and most acids, alkalies and chemicals found in corrosive soil areas. Rugged Densheath jacket withstands toughest abrasion, and weathering.

This cable is light . . . easy to install, splice and terminate. Ask the Man from Anaconda—or your Distributor—for full information. Also—write for Bulletin DM 5450: "Anaconda Cathodic Protection Cable." Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

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Where Anaconda Type CP Cable and Cathodic Protection Cut Corrosion Costs

Tank farms

Booster stations

Pipe lines

Oil Refineries

AND NOW—

Copon

in TRANSCO'S "SUPER INCH"

Long sections of Transcontinental's new 36-inch loop are coated with Copon Internal Pipe Coating for efficient delivery of cleaner gas

Here are the simple, factual reasons why more and more transmission lines are using COPON:

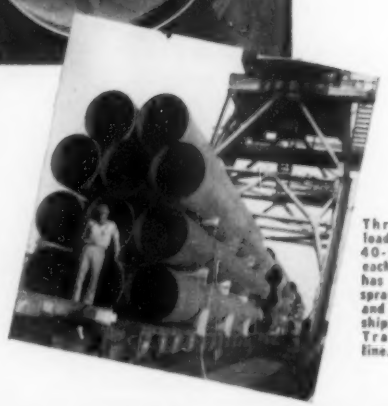
1. Proven protection against corrosion.
2. Complete internal protection of pipe during stockpiling, transportation and laying of line.
3. Reduced cost of using scrubbers and strainers.
4. Cleaner gas delivery greatly reduces maintenance and labor costs.
5. Over the years COPON saves many times its cost.

Our technicians can give your corrosion engineers, and others in your company responsible for obtaining most efficient operation, detailed evidence of Copon's exclusive characteristics.

This Coupon is for Your Convenience in Getting More Copon Facts Pronto!

Rows of 36" pipe, destined for Transco's "Super Inch" line, as it is rolled from Consolidated Western Steel Company's Orange plant to Rossen-Richards' yard where it will be chemically cleaned and sprayed internally with Copon, the effective corrosion control coating.

Close-up showing how pipe is pressure-sprayed with Copon at Rossen-Richards yard in Orange, Texas. Pipe is rotated as automatic sprayheads are slowly pulled through entire 40-foot length of pipe.



Three flat cars loaded with eleven 40-foot joints each. This pipe has been Copon-sprayed internally and is ready for shipment to the Transcontinental line.

Please send me information about COPON Internal Pipe Coating.

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Company_____

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COAST PAINT AND LACQUER COMPANY, INC.
P. O. BOX 1113, HOUSTON 1, TEXAS

Pipeline Patrol

160 miles of 26-in. between Moab and Jensen, Utah.

Associated Pipeline Contractors, Inc., one section of 77.6 miles of 26-in. between Jensen and Green River, Wyo.

A. J. Curtis Construction Co., one section of 82.8 miles of 22-in. from Green River to Sage, Wyo.

B & M Construction Corp., one section of 90 miles of 22-in. between Sage and Lava Hot Springs, Idaho.

Midwestern Constructors, Inc., one section of 95 miles of 22-in. from Lava Hot Springs to Burley, Idaho.

H. B. Zachry Co., San Antonio, sections 9 and 10, 214 miles of 22-in. between Burley and Payette, Idaho.

Fulghum Construction Co., Harrisburg, Pa., sections 11 and 12, 198 miles of 22-in. between Payette and the Columbia River at the Oregon-Washington border.

A. J. Curtis Construction Co., Casper, section 26, 54 miles of 16-In. laterals and 31 miles of gathering-system lines from a point on the main line near Kemmerer, Wyo., to Big Piney field, Wyoming.

R. H. Fulton, Lubbock, section 27, 43 miles of lateral lines and 16 miles of gathering lines from Rangely, Colo., to Piceance Creek field, Colorado.

• **Panhandle Eastern Pipe Line Co.**—Company has plans to loop Peoria lateral before FPC now. The line would be 16-in. pipe running 58 miles from near Springfield to Peoria, Ill.

• **Pine Tree Natural Gas Co.**—204 miles of undetermined size pipe to run from the Boston area to Bangor, Me.

Private Interests.—Proposes to build gas line from Gubik gas field near Navy Petroleum Reserve No. 4 in Alaska to Fairbanks. Line would be 450-mile, 8-in. line and Arctic Contractor, Inc., who handled engineering requirements and preliminary design, estimated the line would cost $20,000,000, although later figures have been much higher than this.

Tennessee Gas Transmission Corp.—Company is carrying out a large expansion program in New York, Pennsylvania, New Jersey, and Ohio. Oklahoma Pipe Line Constructors is working on 113 miles of 24-in. line from Covington to Laska-Waxen, Pa. Bechtel Corp. has lines for the company in New Jersey, and Pennsylvania. H. C. Price Co. has 130 miles of 24 and 26-in. in Ohio and Pennsylvania.

The company has FPC approval for 370 miles of 30-in. from Agua Dulce, Tex., to Kinder, La. The line will cost $35,400,000.

The first has also requested FPC permission to spend $56,000,000 in new pipeline and compressor facilities. The work will include 221 miles of 26 and 30-in. loops in Ohio and Kentucky and 376 miles of gathering lines in Louisiana and Texas. Some 12,450 hp. would be added in new and existing compressor stations in Texas, Louisiana, and Mississippi.

Texas Eastern Transmission Co.—Company has received FPC permission to begin converting its Little Inch line from natural gas to products service. Company has also proposed to Mobilization Director Arthur S. Flemming that the Government give it accelerated amortization on money to invest to put the Big Inch line on standby product service. The company's program is:

...To convert the Little Inch to products with a capacity of 235,000 bbl. daily and to install enough standby pumping equipment to hike the capacity to 375,000 bbl. daily if needed.

...To install standby pumping equipment along the Big Inch that would allow the line to be converted from gas to products in an emergency. The line would have a capacity of 425,000 bbl. daily.

...To build a 382-mile, 24-in. natural-gas line from Beaumont to Kosciusko, Miss., to connect with an existing 30-in. line running to Connelsville, Pa. The company proposes to build enough standby compressor capacity to enable the line to take over both the Big and Little Inch capacities in case of war.

The Texas Eastern proposal clashes with a plan of American Pipe Line Co. to build a line from the Gulf Coast to New Jersey (See table under products).

Texas Gas Transmission Corp.—Company has big building program set to start soon and end approximately November 1.

From Covington, Ky., to Jefferstown, Ky., company will build 77 miles of 26-in. H. C. Price Co.

Company will loop 14 miles of 20-in. at Haughton, La. Houston Contracting Co.

Will build 72 miles of 12-in. from Hardinsburg, Ky., to Bedford, Ind. Also will build 5 miles of 8-in. near Bedfoard. H. C. Price.

From Bastrop, La. to Clarksdale, Miss., the company will lay 50 miles of 30-in. H. C. Price.

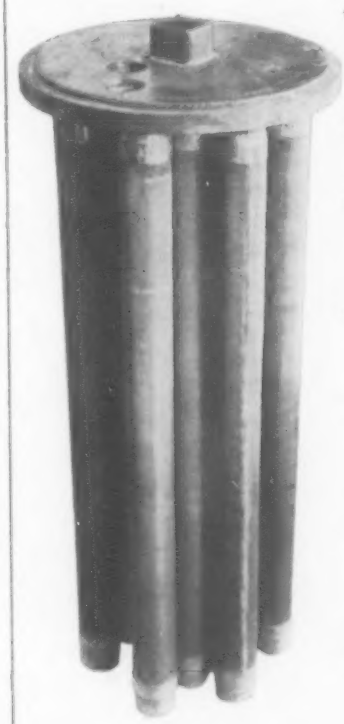
From Eunice, La., to Morgan City, La., the firm will lay 105 miles of 20-in. H. C. Price.

• Company has also filed with the FPC for permission to add 198 miles of line and an additional 20,270 hp. in compressor capacity along the route of its system in Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, and Indiana. The project will cost $20,000,000.

Transcontinental Gas Pipe Line Corp.—Company has awarded the following contracts to lay 315 miles of 36-in. and 219 miles of 30-in.

Associated Pipe Line Contractors, Inc.,

New MOORLANE MULTI-TUBE
PIPE LINE STRAINER
for
PRODUCTS PIPE LINES
Filters dirt, pipe scale and heavier particles



MULTI-TUBE STRAINER ELEMENT

- Filter element can be cleaned *in the strainer* by backwashing.
- Cleaning operation takes less than five minutes.
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- Very low pressure drop during operation.
- On a barrel per dollar basis, the cost is much lower than conventional strainers.
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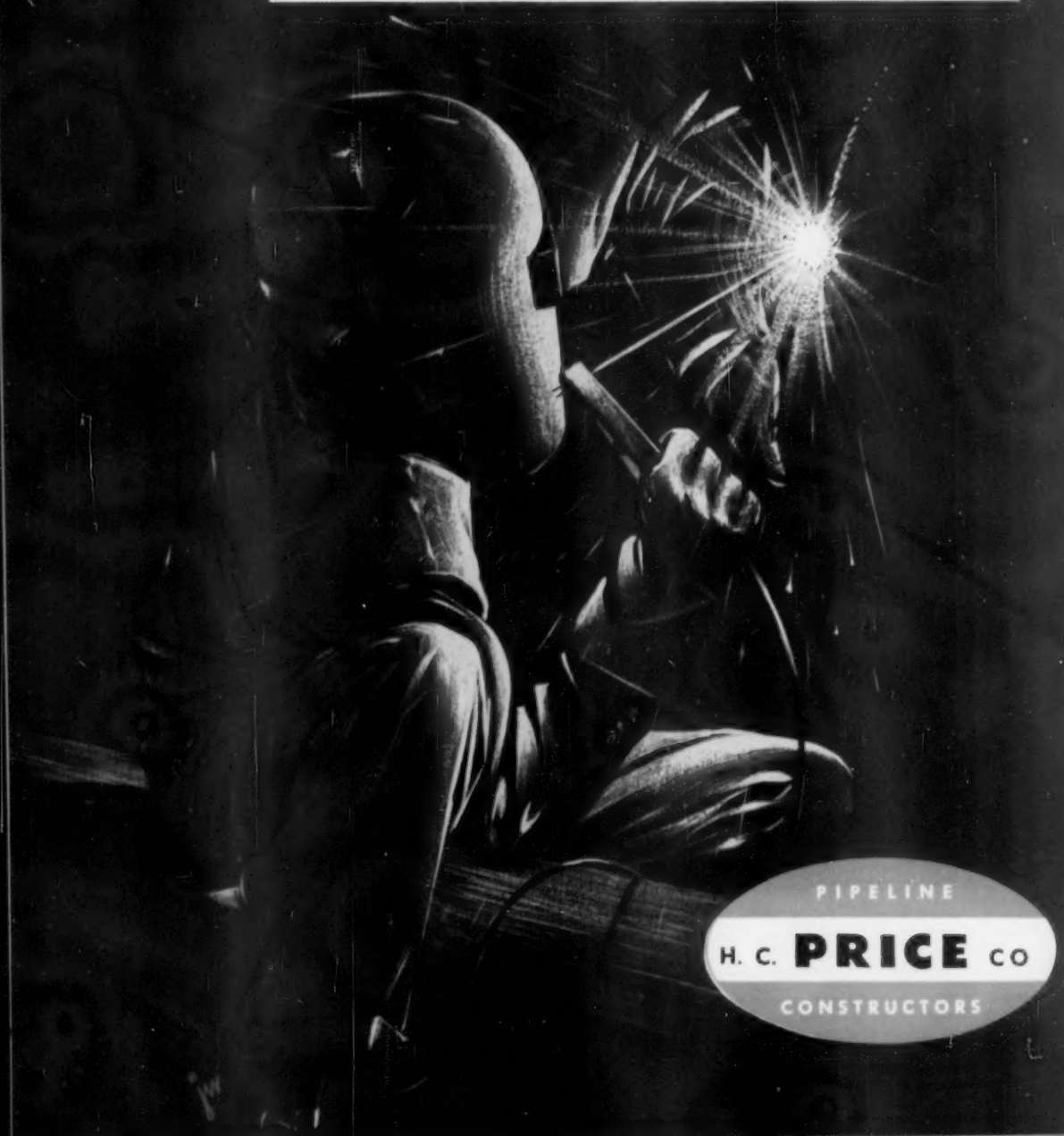


will lay 63 miles of 36-in. in Louisiana and Mississippi and 71 miles of 30-in. in Virginia and Maryland.

Midwestern Constructors, Inc., will lay 14 miles of 30-in and 54 miles of 36-in. in Alabama and Georgia.

Western Constructors will lay 77 miles of 36-in. in Georgia and South Carolina.

Panama-Williams Co. will lay 36 miles of 30-in. and 31 miles of 36-in. in South Carolina and North Carolina.

Williams Brothers Co. will lay 72 miles of 30-in. in Virginia.

• Company has received FPC examiner approval to build 24 miles of line in South Bayou Mallet, Maxie, and Happytown fields in Louisiana to gather gas for movement in its interstate lines.

Transok Pipe Line Co.—Company has let contract to Pipe Line Service Co., Seminole, Okla., to lay a 140-mile, 24-in. line from Garvin County, Oklahoma, to Tulsa. The firm will also build a gathering system in the Bradley, West Lindsay, and Northwest Purdy fields.

• **Trunkline Gas Co.**—Firm has applied to FPC for authority to build eight new compressor stations and 24 miles of pipeline on its transmission system to enable it to sell additional gas to Panhandle Eastern Pipe Line Co. Total capacity of the new stations would be 56,000 hp. Total cost would be $18,700,000, including $1,000,000 for gathering facilities in the Gulf Coast area. Panhandle filed for 1,600 hp. additional compressor capacity to cost $3,714,000.

• **United Gas Pipe Line Co.**—Company has applied to FPC for permission to construct 63 miles of 16 and 20-in. natural-gas line in Mississippi, Alabama, and Florida. The company will also add 330 hp. to its compressor stations. Cost for the job will be about $8,300,000.

• **Utah Natural Gas Co.**—Planning 40 miles from Orem to Salt Lake City, 16-in. pipe at later date. Contract not yet let.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Foreign Crude-Oil Pipelines

• **Atlas-Dresser.**—Included in this company's agreement with the Argentine Government are plans to build a 400-mile, 16-in. crude line from Plaza Huincul area to Bahio Blanca.

Bolivian Government—Williams Brothers has contract to build a 220-mile, 6-in. crude-products line from Cochabamba to Orura to La Paz. The line is described completely in The Oil and Gas Journal of May 16, 1955, page 136.

Canadian Gulf Pipe Line Co.—Williams Brothers has contract to build 17 miles of 4-in. and 36 miles of 6-in. for this company from Clive and Joffre fields to its connections at Stettler.

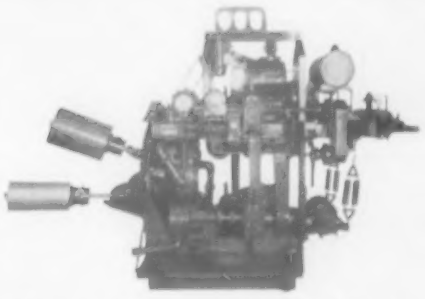
Peace River Oil Pipe Line Co., Ltd.—Fulton-Banister, Ltd., has contract for 106-mile line from Sturgeon Lake field in Northwest Alberta to the Edson pumping station of Trans Mountain Oil Pipe Line Co., Ltd. The project includes 41 miles of 16-in. and 65 miles of 12-in. Completion is set for October 1.

Pembina Pipe Line, Ltd.—Company has let approximately 400 miles of gathering lines in Pembina field to Hupp, Ltd. Work began last year and will be completed in November 1955.

• **Standard - Vacuum Oil Co.**—Company has long-range plans for a 90-mile pipeline to give the new Lirik field in Central Sumatra an outlet. Completion is not scheduled before 1957 or 1958.

• **Westspur Pipe Line Co.**—This company sponsored by Imperial Oil, Ltd., proposes to

proved...
efficiency and durability
over miles of pipelining



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Pipeline Patrol

build a crude-oil line from southern Manitoba and Saskatchewan to a connection with the Interprovincial system running from Edmonton to Sarnia.

Yacimientos Petroliferos Fiscales Bolivianos—Williams Brothers has contract to build a 230-mile, 6-in. products line from Cochabamba-Oruro-La Paz. The line will cost approximately $7,000,000. The Bolivian Government will eventually add a 10-in. products line from Oruro to Arica, Chile.

• **Others.**—For plans for further crude lines in Canada that have not yet been fully formulated, see The Oil and Gas Journal, April 4, page 79.

Foreign Products Pipelines

• **Empresa Nacional del Petroleo.** — 80 miles, 6⅝-in., planned, Concon to Santiago, Chile.

• **Governments of South Rhodesia and Portuguese East Africa.** — 200 miles, considered. Beria, Portuguese Mozambique to Umtalia, Southern Rhodesia.

• **Iraq Petroleum Co., Ltd.**—Company is making plans to lay a 75-mile, 24-in. products line from Homs, Syria, to Tripoli, Lebanon. The line would have a capacity of 180,000 bbl. daily.

• **National Fuel Oil Co.**—This company in Israel is a shareholder in a company which plans to build a products line between Haifa and Tel Aviv. The plans call for a 55-mile 6-in. line in which the Government would own 10 per cent.

• **National Iranian Oil Co.** — Company plans $32,300,000, 573-miles, 10-in. products pipeline from Ahwaz to Teheran, Iran. The line will have a capacity of 40,000 bbl. daily. Costain-John Brown, Ltd., London, will build the 337-mile southern part. Entrepose, Paris, will build the northern 236 miles.

• **North Atlantic Treaty Organization (NATO).**—This defense organization is building products lines to airforce bases in various parts of France. Approximately 2,000 miles of 4-10-in. line will be laid.

Oleoducto del Pacifico, S.A.—Company is building 100-mile, 6 and 8-in. products line from Buena Ventura to Cali, Colombia. Pipeline Engineering Co. of Dallas, Tex., has the engineering contract. Williams Brothers is laying the line.

Overland Pipeline Corp.—This South African firm has requested government permission to build a 350-mile line, to cost $8,450,000, from the South African coast to Rand, a plateau area in southern Transvaal where there is heavy petroleum consumption.

• **Sinclair Oil Corp.**—Company is considering a 240-mile crude-oil line from its San Silvestre field in the state of Barinas, Venezuela, to Puerto Cabello on the Caribbean Sea coast. The line would cost $25,000,000.

• **United States Government.** — 375 miles, 12-in., planned, St. Nazaire to Melun and Metz, France.

U. S. Defense Department.—U. S. Defense Department is sponsoring a 485-mile, 8, 10, 12-in. products line from Cadiz to Zaragoza, Spain. The contract has been let to Merritt, Chapman & Scott; Benson & Root, of Oklahoma City; and Agroman Construction Co., a Spanish firm. Brown-Raymond-Walsh is the prime contractor. Cost of the line will be approximately $5,000,000.

Winnipeg & Central Gas Co.—Canadian company plans to build a $20 million butane-propane system. Company plans to get gas L.P.G. from Signal Oil & Gas Co.'s Tioga, N. D., plant and move it to Winnipeg. Size and route of the line has not been definitely established.

Foreign Natural-Gas Pipelines

Alberta Gas Trunk Line, Ltd.—This Canadian firm has let engineering contracts to two firms, Dutton, Williams Brothers, Ltd., and Mannix, Ltd., for a 300-mile, big inch gas-gathering system to collect Alberta's natural gas for transportation to Trans Canada Pipe Line Co.

Attock Oil Co.—Company plans to build 60-mile natural gas pipeline from Dhulian field to Rawalpindi in West Pakistan.

• **Canadian Western Natural Gas Co.**—Firm will begin work this spring on a $1,000,000, 59-mile natural-gas project in southern Alberta. The company will also add a compressor station at Lethridge, Alta.

• **Empresa Nacional del Petroleo.** — 80 miles, 10-in., planned, Concon to Santiago, Chile.

South Alberta Pipe Line, Ltd.—Company has filed permit to construct a 150-mile, 8-in. natural-gas line from Etzikom field to serve a nitrochemical plant to be built near Medicine Hat, Alta. The line will cost about $1,000,000.

Trans-Canada Pipe Lines, Ltd.—Company has postponed start of 2,250 miles of 24-34-in. line from Alberta-Saskatchewan border to Toronto and Montreal until next year because of financing difficulties. Company also plans a 24-in. lateral from Winnipeg to Emerson, Man. Twenty-inch lateral from Niagra to Toronto now in operation. Plans for line to enter U. S. may be considered.

Saskatchewan Power Corp.—Company has let contract to Majestic Contractors, Ltd., Edmonton, for a 226-mile natural-gas pipeline from Coleville to Prince Albert. The line from Coleville to Saskatoon will be 116 miles of 14-in. From Saskatoon to Prince Albert, the line will include 40 miles of 12-in. and 70 miles of 10-in. Banister Construction, Ltd., has the distribution system for Prince Albert.

• **Westcoast Transmission Co., Ltd.**—Company has signed agreement with Pacific Northwest Pipeline Corp. and has revived plans for its line from the Peace River area of Alberta and British Columbia to the United States border near Sumas, Wash. Plans call for work to begin sometime this year. Company has also announced plans for a second line to parallel the first and to swing east into the Okanagan Valley.

designed especially for *continuous* outdoor use . . .

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MOTORS

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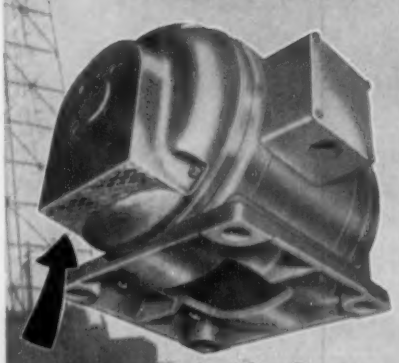
The FIELDMASTER has many other **outstanding advantages** that our distributor, the BETHLEHEM SUPPLY COMPANY, will be happy to show you. May we have them contact you . . . **without obligation?**



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LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that two separate parcels of land, comprising 34.39 acres within the known geologic structure of the Waskom field, and 235.35 acres within the known geologic structure of the Mooringsport field, Louisiana, will be offered for oil and gas leasing through competitive bidding to the qualified bidders of the highest cash amounts per acre at 1:00 p.m., E.S.T., July 20, 1955, when bids will be opened. Details of the lease offering, description of the lands, how and where to submit bids, and bid forms may be obtained from the Supervisor, Eastern States Office, Bureau of Land Management, Washington 25, D. C. C. R. Drexilius, Supervisor.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that two separate parcels of land, comprising 42.17 acres within the known geologic structure of the Cartersville field, and 48.52 acres within the known geologic structure of the Elm Grove field, Louisiana, will be offered for oil and gas leasing through competitive bidding to the qualified bidders of the highest cash amounts per acre at 1:00 p.m., E.S.T., July 27, 1955, when bids will be opened. Details of the lease offering, description of the lands, how and where to submit bids, and bid forms may be obtained from the Supervisor, Eastern States Office, Bureau of Land Management, Washington 25, D. C. C. R. Drexilius, Supervisor.

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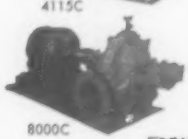
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Buying an engine is a big decision. And equally important is where you buy the engine . . . because it is the cost of operating and maintaining your engine in the long run (not the first cost) that finally determines what you pay for it. When you are ready to buy engines, we would like to tell you the definite advantages available to you when you deal with Stewart & Stevenson. We can give you an impartial evaluation of your power needs . . . we can assume full responsibility for your job . . . we will guarantee it to perform as specified . . . we maintain the Nation's largest distributor stock of parts and service not more than two hours from your installation. In addition, we have a backlog of experience gained through thousands of engine applications in practically every conceivable industry.

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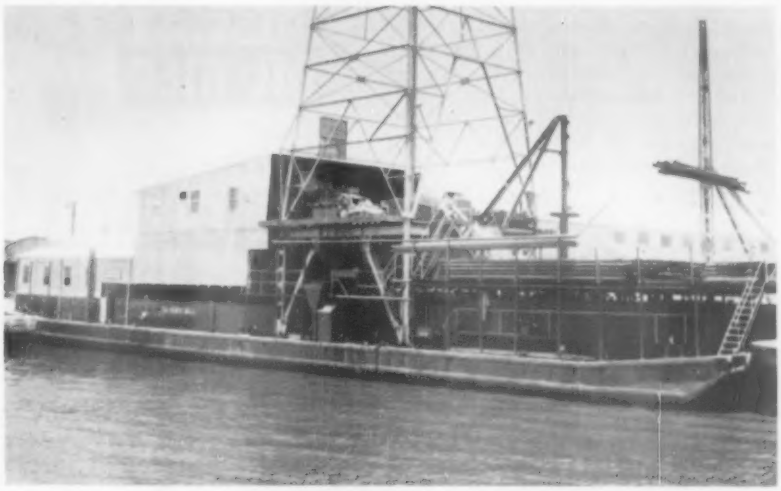

Bateman Drilling Co.'s new diesel-electric-powered drilling barge

Barge Rig Uses "Packaged" Diesel-Electric Power Units

Bateman Drilling Co., New Orleans, is putting into operation the first drilling barge to use "packaged" diesel-electric power units. Similar-type units were introduced to the drilling industry recently in a land-rig installation owned by Offshore Co., of Baton Rouge *(The Oil and Gas Journal, June 27, page 127)*.

Bateman's drilling barge is christened "The Henry Bell" for the late Henry Bell, early partner of Earl Bateman, owner of the drilling company. It was built by Hunt Tool Co.

The power plant, designed and manufactured by Alco Products, Inc., includes two 800-hp., 900-r.p.m., 6-cylinder, 9 by 10½-in. (Model-251) diesel engines, each skid-mounted with two main generators, two auxiliary generators, and associated accessories.

Main generators of each unit are of the differential-field type, one of 500-kw. 250-volt capacity for mud-pump motors, and the other of 400-kw. 250-volt capacity for draw-works motors. Each generator can be operated singly, or in combination, from the driller's control console, and in an emergency, the entire rig can be powered from either main generator set. Auxiliary generators are 50-kw., 125-volt capacity, each. They are belt-driven from the main-generator shaft, and supply all auxiliary power for the rig.

Two 500-hp., 600-r.p.m. shunt-field motors are provided in the draw-works-drive assembly, and two 600-hp., 600-r.p.m. motors on the mud pumps.

The rig assembly has a steam-type draw works; two 7¾ by 16-in. mud pumps; a 136-ft., 900,000-lb.-capacity derrick with a substructure rated at 1,650,000-lb. capacity; a 450-ton crown block and a 350-ton hook and traveling block, handling 1¼-in. drilling line. Rated drilling-depth capacity is 15,000 ft.

P. E. Trichel, Jena, La., is contractor on a 2,500-ft. Sparta wildcat test Charles B. Ivy, of Bentonville, Ark., is starting at 1 Ivy-McAdams heirs, in 17-6n-2e, 2¾ miles northwest of the discovery well on the new Virgin Bend field, in the southeast corner of Grant County, north Louisiana. Location is 7½ miles southeast of Pollock.

Dorris Ballew, Inc., Natchez, Miss., will drill a 6,000-ft. Wilcox well for R. A. Campbell, of Vidalia, La., in the Ross Bayou area, 20 miles southwest of Vidalia, in western Concordia Parish, eastern Louisiana. Location at 1 Livingston, in 7-6n-7e, is southwest of production.

Adkins Drilling Co., San Antonio, has taken on the drilling of a deep test in northern Gonzales County, Southwest Texas. Operators, Gulf Coast Leaseholds, Inc., and Alfred C. Glassell, Jr., of Houston, plan to carry the

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hole to the basement schist, expected about 10,000 ft. Location at 1 Johnson, in the Thomas Fowle Survey, is 4½ miles northeast of Slayden, and about 9 miles north of Gonzales.

Woolf & Magee, Tyler, Tex., have two new contract operations under way in Natchitoches Parish, western Louisiana. Both are 6,500-ft. wildcat tests. One is for Nebo Oil Co., Inc., of Dallas, at 34 Nebo-Nebo fee, in 13-12n-8w, 6 miles northwest of Creston. The other is for A. J. Hodges Industries, Inc., and Ira A. Wyant at 1 Merchants, in 14-6n-6w, 2½ miles south of Derry.

Mountain States Drilling Co., Denver, will drill a 6,000-ft. Wasatch test for Sinclair Oil & Gas Co. in the Little Snake area, 20 miles south of Powder Wash field in Moffatt County, northwestern Colorado. The test is on government land in 28-8n-97w.

Carmack Drilling Co., Casper, Wyo., has a rig running on a wildcat location 3 miles east of Adena field, in Morgan County, northeastern Colorado. The test, 1 Hough, in 22-1n-57w, is a joint operation of Carmack and Steele Drilling Co.

Calvert Drilling Co., Oklahoma City, affiliate of Calvert Drilling, Inc., Olney, Ill., has contracted to drill for Texota Oil Co. at a wildcat location in northwestern Burke County, North Dakota. Location at 1 Ely, in 32-163n-93w, is about 8 miles south of the Canadian border.

Goldrus Drilling Co., Houston, is moving a rig to the new southwest extension area of Live Oak field, in Vermilion Parish, Coastal Louisiana, where it will drill for Wherry & Green and H. L. Martin at 1 Foster Unit, their first in the field. Permitted depth is 12,500 ft.

Webster Drilling Co., Houston, has another deep operation under way for Southern Natural Gas Co. in the Franklin area, in St. Mary Parish, Coastal Louisiana. Location is for 1 Perry, in 38-15s-9e. Permit is for a 13,000-ft. well.

Circle Drilling Co., Lake Charles, La., will be the contractor on another test C. B. Pennington, of Baton Rouge, will put down northwest of Baton Rouge, in East Baton Rouge, South Louisiana. Location, at 1 Carruth, in 66-5s-1w, is about ½ mile northeast of 10,300-ft. dry hole recently abandoned by Pennington. The new test is scheduled to go only to the Vicksburg around 8,200 ft. Bottom of the first test was in Wilcox.

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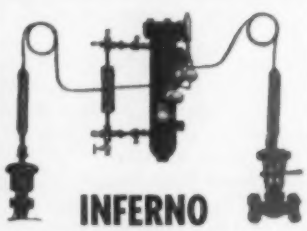

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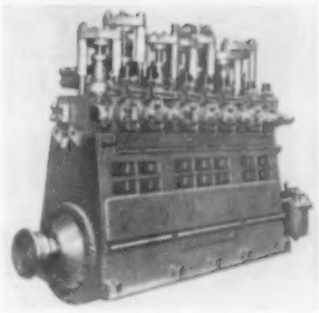

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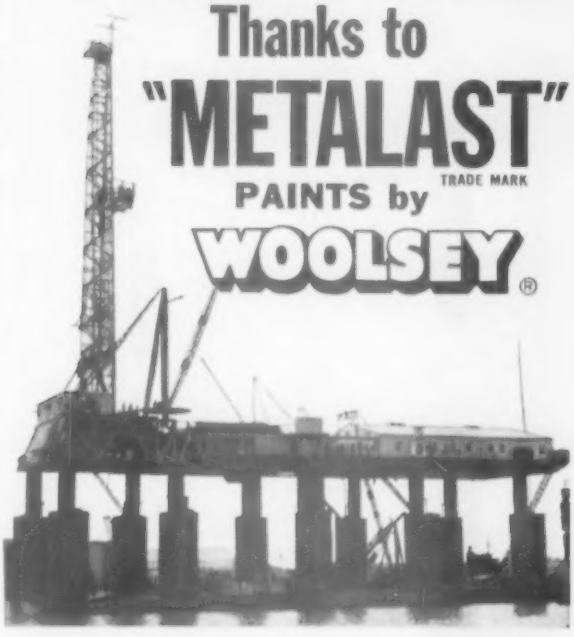

Ocean Drilling & Exploration Co. of New Orleans, La. chose "Metalast" to paint and protect this new $2,500,000 drilling rig.

• Offshore oil drilling installations are benefiting from the knowledge gained by the marine industry in recent years—that there is no better way to prevent the rusting and corrosion caused by salt air and water than by painting with Woolsey "Metalast."

"Metalast" is the marine vinyl coating developed by Woolsey during World War II—the most effective and economical type of corrosion-preventive known. Unlike ordinary anti-corrosive paints, "Metalast" does not deteriorate upon exposure—thanks to its special vinyl resin base. It is equally effective above or under water...and one painting lasts for years!

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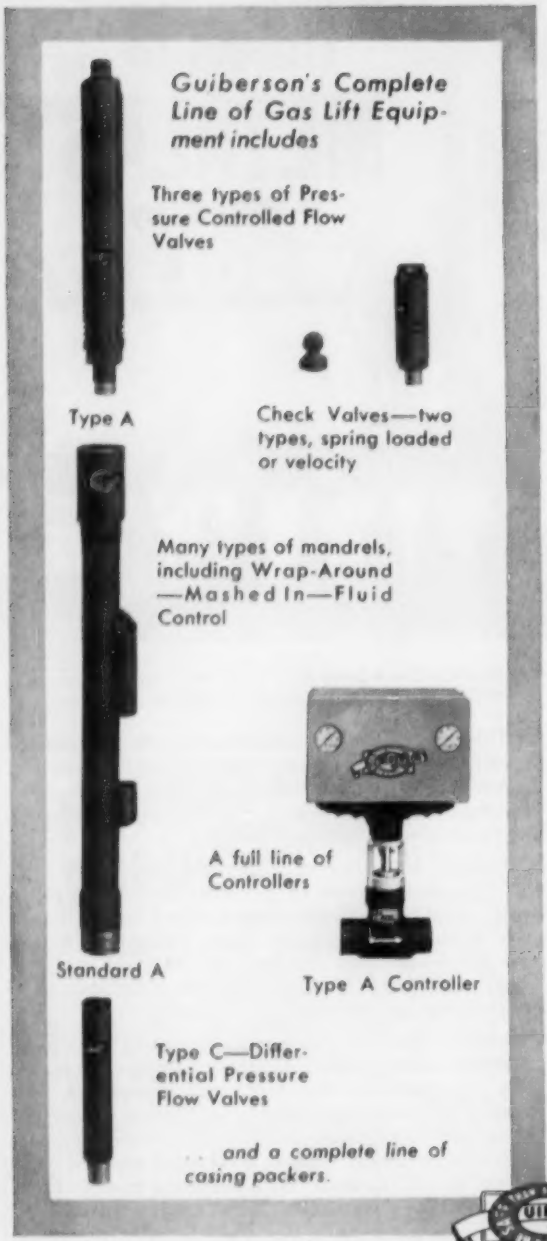
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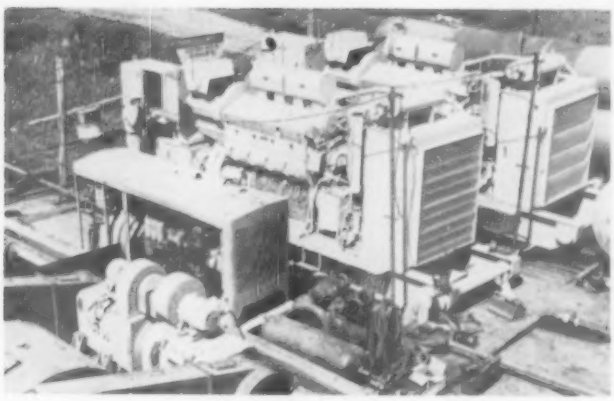
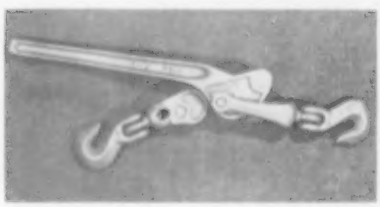


Diesel-Electric Matches Drilling Needs

Here is a new high-horsepower, diesel-electric power unit for the oil industry that can be used in multiple to meet any deep-well drilling requirement in both land and offshore operations. It brings to the drilling industry an extremely flexible, lightweight power system easy to move from one location to another and simplified in its operation.

Basic units consist of 8 or 12-cylinder General Motors 567C two-cycle diesel engines which develop 875 and 1,310 hp. respectively. The unit is mounted on portable skids with two generators, a generator-control cabinet, and an engine-cooling apparatus. D.c. electricity from the generators is supplied by cable to the 625-hp. motors which, singly or in pairs, supply power for the mud pumps, draw works, and rotary table. Protective relays and control circuits are basic in the control scheme.

The new power plant offers a power source that inherently more nearly matches the speed-torque characteristics required for draw works, mud pumps, and rotary table. In mud-pump operation, it indicates when liner size should be changed. And in draw-works operation, it provides higher starting torque and wider speed range than earlier diesel-electric drilling rigs. Electricity is carried by heavy cable from the engine units to a motor-control cabinet, with two leads going from this cabinet to each motor. Cables are quickly and easily connected and disconnected with no bolting nor taping required. **For more information write or call: Electro-Motive Division, GENERAL MOTORS, La Grange, Ill.**



Cam Action of Loadbinder Eliminates Accidents

A new series of E-Z Pull loadbinders features a patented cam action. Pull-down to lock position is so easy that cheater bars are usually unnecessary and dangerous handle snapdown is eliminated. Cam action eliminates slackoff when the handle is pulled down and locked. Patented design also permits use of a loadbinder around curves or square corners without slack-off. Safety features include elimination of dangerous kickback when the handle is released. Available in 12 different models. **For more information write or call: TEXAS FOUNDRIES, INC., P. O. Box 180, Lufkin, Tex.**

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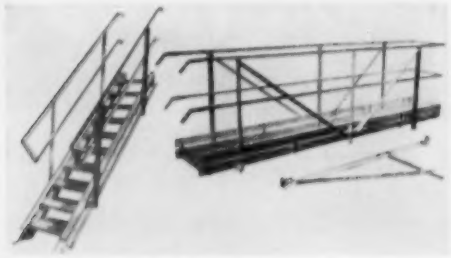

New Design Eliminates Struts

A new design of steel stairways and walkways for industrial installations eliminates the need for supporting truss rods. Dual hand rails, which also provide an additional safety factor, serve as the supporting truss, suspending the walkways and stairways rigidly when bolted to the structure. For interior installations or bridging, floor-space conservation is a distinct advantage.

The new stairways, with safety treads, are fabricated in 4, 6, and 8-ft. sections which may be bolted together in any length and any practical height. The sections come equipped with toe boards and angle-iron hand rails and supports. The standard design is 26-in. wide, prime-painted with an oven-dried coat of aluminum-finish paint. On special order, the sections may be hot-dipped galvanized after fabrication. **For more information write or call: COLUMBIAN STEEL TANK CO., 1509 W. 12th Street, Kansas City, Mo.**

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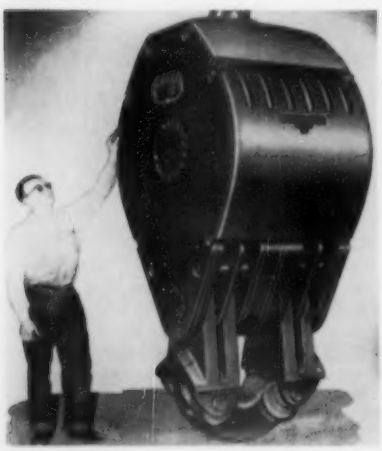

Giant Traveling Block Has Weight Advantage

A new 450 and 500-ton series RP traveling block is extremely compact, yet excellently balanced. This, coupled with its weight advantage, gives a free, fast-falling block when using the largest drilling lines. The block is made with either five or six sheaves. The five-sheave 450-ton block weighs 14,000 lb., and the six-sheave 500-ton block weighs 16,000 lb. Featured are 50-in. o.d. alloy-steel flame-hardened sheaves; double-row Timken bearings; 10½-in. alloy-steel center pin; Klipper grease seals protecting each bearing; center or divider plates between each sheave eliminating center-pin deflection and consequent bearing damage; and patented E-Z opening guards for quick stringing-up. Pictured is the 72 by 50-in. sextuple. **For more information write or call McKISSICK PRODUCTS CORP., 2857 Dawson Road, Tulsa, Okla.**

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Skyhook Allows Quicker Ascents for Tower Men

A new safety elevator, the Skyhook, allows quicker ascents, fewer stops for rest, and eliminates most of the dangers of falling and fatigue for men climbing considerable heights.

The Skyhook operates in this manner. A long cable runs through a sheave attached to the structure at head of ladder. At one end of cable is a double safety belt which the climber straps around his waist and seat. On the other end is the steel counterbalance which glides up and down a guy wire attached to structure. As the man climbs upward, the counterweight glides down the guy wire, counterbalancing most of the man's weight. The higher he climbs, the lighter he gets because the weight of the cable passing through overhead pulley is added to the counterbalance side. **For more information write or call: DYKES, INC., 1121 Rothwell, Houston 2, Tex.**

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GenTex Hat Gives Comfort For Full-Time Usage

The GenTex hat is designed not only for superior protection but for the long-wearing comfort that insures full-time wearing and full-time protection. Exceeding all federal specifications for safety insurance, the hat insulates against heat and sun. The strong plastic construction withstands over 10,000 volts. The snap-in sling features an easily-adjustable headband.

Available in green, gray, white, blue, and yellow, the GenTex safety hat shows less than ⅜-in. penetration of a 1-lb. plumb bob dropped 10 ft. There are no holes, bolts, or rivets to permit conduction of temperatures or voltage. Weight of hat, sling, and assembly is 14½ oz. Available in either brim or cap models. **For more information write or call: GENERAL TEXTILE MILLS, INC., 450 Seventh Avenue, New York 1, N. Y.**

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Slush Pumps Adaptable To Jet-Bit Drilling

Power-driven slush pumps feature input ratings of 700 and 1,000 hp. respectively. Readily adaptable to jet-bit drilling, the pumps fit in with the trend in the industry to provide greater pump capacity on rigs. The Ideal G-700 slush pump has a maximum input horsepower of 700 at 70 s.p.m.

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These results indicate that in the two regular acidizing treatments, clay and silicate materials were swollen by spent hydrochloric acid and had partially plugged the flow channels. Often in such cases, regular acidizing actually decreases production. However, XM Acid contains a Dowell-developed additive which is designed to control silicate swelling and eliminate such plugging.

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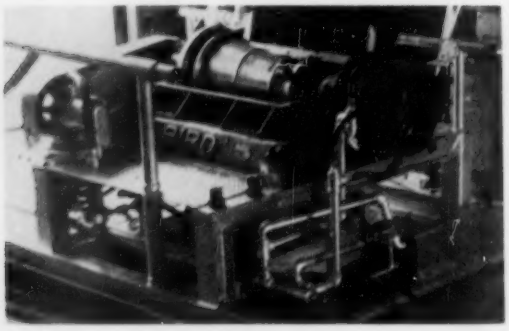

Mud Centrifuge Is for Viscosity Control

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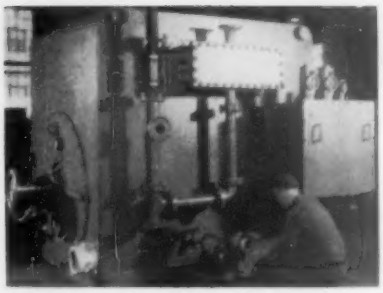

Gas-Filled Motors Exclude Volatile Ambient Gases

A line of totally-enclosed, inert-gas-filled motors is available in a wide range of ratings for safe operation in hazardous, gas-contaminated areas.

Inert-gas-filled enclosures utilize air-to-water surface-heat exchangers to remove the heat of motor losses. They differ from conventional water-cooled machines in that provision is made for maintaining an inert-gaseous atmosphere within the enclosure. Under positive pressure, the nonexplosive gas inside the motor keeps out volatile ambient gases that could cause an explosion.

To keep gas replacement at a minimum, inert-gas-filled stator yokes are specially constructed of plate steel with gas-tight welds at all joints. Seals on shaft extensions prevent gas leakage outward along the shaft. A gas-pressurizing manifold is used to maintain positive pressure within the housing. Other special equipment includes explosionproof instrumentation for temperature detection, liquid-level alarm, and water-flow metering.

Motors of this type, rated 3,000 hp., 2,300 volts, and 1,800 r.p.m. are being supplied to refineries to drive high-speed centrifugal compressors. **For more information write or call: ALLIS-CHALMERS MANUFACTURING CO., General Machinery Division, 1126 S. 70th Street, Milwaukee 1, Wis.**

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Condensate Control System Helps Heat-Transfer Units

Greatly improved heat transfer in process equipment with substantial fuel savings resulting from direct discharge of condensate to the boiler are attained through the C-B system of condensate control.

The jet-loop design, upon which the system is based, combines a jet pump and a centrifugal pump to accomplish this. Hot condensate and entrained air are drawn from the process equipment by the jet pump. The motive fluid for the jet is supplied by the centrifugal

pump, which draws this water from the thermo-priming loop. The discharge from the jet causes a flow of returned condensate in the priming loop, and the introduction of this additional volume of condensate into the constantly filled loop results in the discharge of equal volume through the air separator into the boilers. This closed system between equipment and boiler permits condensate to be returned to the boiler at maximum temperature and pressure. **For more information write or call: COCHRANE CORP., 17th & Allegheny Avenue, Philadelphia 32, Pa.**

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Cups and Packings Made to Handle Hydraulic Fluids

Chemically inert piston-cup, U-cup, and flange packings have been developed to answer present-day hydraulic-cylinder packing problems. Made of Teflon, they provide positive protection against the corrosive action of all types of synthetic nonflammable fluids.

The new packings can be used at operating temperatures to 350° F. They are self-regulating to compensate for pressure. Tested and used by major manufacturers of hydraulic cylinders, they meet all performance requirements, even under severe conditions.

Piston-cup packings are available in a standard range of nominal cup sizes from 1 to 12 in. They are recommended for pressures up to 2,000 psi. U-cup packings are furnished either to piston or cylinder specifications, and are recommended for pressures to 1,500 psi. Flange packings are available to specification for pressures to 2,000 psi. **For more information call or write: CRANE PACKING CO., 1800 Cuyler Avenue, Chicago 13, Ill.**

New Regulator Designed With Unibolt Choke

The Type 2815-DRT Regulator, a special application of the diaphragm-control topworks, has the efficient Unibolt choke to provide automatic control of the reduced pressure delivered by the valve.

The valve is a standard 2-in. heater choke furnished with a special inner-valve-stem and hub assembly to meet diaphragm-control requirements. The inner valve seat may be ½, ¾, or 1 in., and either the long-nose choke or the standard body may be specified. With the long-nose body, the unit is used with indirect heaters to allow gas being delivered to expand within the heated water jacket, preventing freezing at the valve outlet. With the standard body, the Type 2815-DRT can be used as a pressure regulator in field lines. Working pressure is 5,000 lb. and test pressure 10,000 lb. **For more information write or call: BLACK, SIVALLS & BRYSON, INC., 7500 E. 12th Street, Kansas City 26, Mo.**

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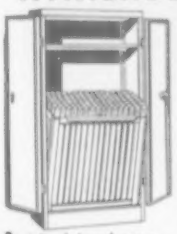

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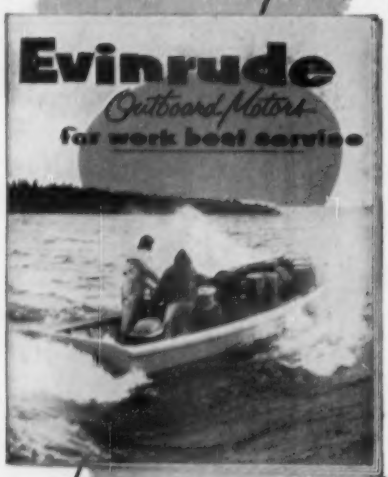

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Petrofrac Increases Production from 32-Year-Old Stripper Well. Perforated for loose-leaf binding, this case history outlines the problem involved in increasing production from an old well that was producing 1½ bbl. per day from sandstone. It describes the fracturing method used and the results, i.e. 21 bbl. of oil per day, 5 months after treatment. **For more information write or call: DOWELL INCORPORATED, P. O. Box 536, Tulsa 1, Okla.**

•

New Tri-Non Analyzer Series. A new two-color product bulletin describes the four series of Tri-Non analyzers for continuous control of chemical process gas streams. Each series varies in complexity of design, and the application of each to various analytical problems is discussed. Description of each series, including prices, and complete specifications are given in the bulletin. **For more information write or call: PERKIN-ELMER CORP., Main Ave., Norwalk, Conn.**

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New Cooling Control. Bulletin 700-A describes new self-powered T44 cooling control which holds temperature of cooling water in jackets or coils of equipment such as compressors, oil coolers, condensers, and stills. Adjustable ranges are between 40° and 200° F. The single seated valve is suitable for use with water containing scale forming minerals. **For more information write or call: SARCO COMPANY, INC., Department P, Empire State Building, New York 1, N. Y.**

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Get Perfect Water Clarity with Celite Filtration is the title of a new 12-page, illustrated brochure. It covers filtration of potable water, process water, and plant wastes. The brochure explains how Celite diatomite filter aids remove colloids and other suspended impurities, shows the adaptability of Celite powders to various types of filter designs, and cites representative installation where Celite is being used to advantage. The latter includes examples of special interest to plant and power engineers, oil men responsible for clarification of repressurizing water, and operators of any business interested in extra water clarity or elimination of pollution and water waste. **For more information write or call: JOHNS-MANVILLE, 22 East 40th Street, New York 16, N. Y.**

•

Types HLM-HIM Centrifugal Pumps. Built to handle high static heads, the pumps described in Bulletin 350-28 feature single-stage, double-suction, centrifugal design. New purge-type grease lubrication, which forces grease through ball bearings with a cleansing action, is said to lengthen bearing life. Ring-oiled ball bearings are also available at extra cost. **For more information write or call: AMERICAN-MARSH PUMPS, INC., Battle Creek, Mich.**

•

Worthite Centrifugal Pumps for Acids, Alkalies, and Slurries is title of new 20-page Bulletin No. W-350-B14B. Features of the bulletin include: (1) information and an outline drawing of Worthite pumps with a standard stuffing box; (2) photographs of typical open-type impellers; and (3) parts list, diagram of standard mechanical seal, and complete information on application and construction modifications. Seven pages of rating charts show hydraulic coverage for both 50 and 60-cycle speeds. **For more information write or call: WORTHINGTON CORPORATION, Advertising & Sales Promotion Department, Harrison & Worthington Avenues, Harrison, N. J.**

•

Comparative Properties of Protective Coatings. This 19-page report by Gerald F. Gilbert, Jr., contains information on 14 types of coatings used widely to protect equipment, walls, beams, and ceilings in plants where fumes and industrial atmospheres cause corrosion. Included in the report is physical and chemical data and a three-page section on the selection of coatings. A chart in the presentation shows comparative value of the various coatings as protection against weather, impact, abrasion, heat, water, and various chemical groupings. **For more information write or call: ATLAS MINERAL PRODUCTS CO., Mertztown, Pa.**

•

Controlled Volume Pumps for Dependable, Low-Cost Service. New bulletin H20-1 describes controlled-volume-pump Model H-20 designed for accurate chemical feed at low cost. Complete information includes data on sim-

plex and duplex models, capacities, pressure, materials of construction, and mounting dimensions. **For more information write or call: MILTON ROY CO., Station H, 1300 East Mermaid Lane, Philadelphia 18, Pa.**

●

Chemical Cleaning of Catalytic Cracking Equipment. A perforated data sheet, this bulletin contains the problem of removal of organic and inorganic deposits from the shell sides of six slurry exchangers on a fluid catalytic cracker without shutting down the unit. The method used, cleaning procedure, and the results are summarized and the equipment is illustrated by means of a flow diagram. **For more information write or call: DOWELL INCORPORATED, Tulsa, Okla.**

●

Everywhere in the World. Price list No. 66, published June 20, 1955, tabulates part number, part name, size, and price of sand pumps from 3½ to 5½ in. in diameter, and of regular and sectional dart-valve bailers from 2½ to 7 in. in diameter. **For more information write or call: MILLER SAND PUMP CO., Phone MElrose 7-4884, P. O. Box 4516, Oklahoma City, Okla.**

●

Seventy-Five Years of Service to Industry, 1880-1955. This multicolor anniversary brochure traces the evolution of the company that started as a general machine-shop business making tubular boilers of low pressure and small capacity, to the present industry that fabricates steam generators, heat-transfer equipment, pressure vessels, valves, fittings, flanges, and refrigeration and ice-making equipment. **For further information write or call: HENRY VOGT MACHINE CO., Louisville, Ky.**

●

Pur-O-Cor for Water Flooding, a two-page fact sheet, covers the effectiveness of Pur-O-Cor in bacteria control, corrosion control, and increased intake rates. It also devotes considerable attention to the cost of treating flood water. An illustration depicts a typical installation of Pur-O-Cor treatment. **For more information write or call: BRADFORD CHEMICAL CO., INC., Phone 5566, 20 Congress St., Bradford, Pa.**

●

Clipper Oil Seal is an illustrated, 28-page manual with information arranged for quick reference. It covers the selection, application, and installation of Clipper seals. Descriptions cover the latest seal designs including the new LPD and RPD, the extruded and molded oil slingers and end-face seals. Important points are illustrated by photographs and detailed drawings. Essential data is in tabular form for easy use. Documented case histories also are included. **For more information write or call: JOHNS-MANVILLE, 22 East 40th Street, New York 16, N. Y.**

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DTR Diamond Drill Bits, a two-color brochure, lists six reasons why exploration and drilling crews should use DTR diamond drill bits. In addition, the brochure tabulates bit size, set bit dimensions, carat weight, and fabrication and setting cost. **For more information write or call: DIAMOND TOOL RESEARCH CO., INC., GRamercy 5-3530, 380 Second Avenue, New York 10, N. Y.**

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The Manufacture of Heavy Capital Equipment. This 20-page, illustrated book details the equipment and staff of a British firm devoted to the manufacture of large pressure vessels, towers, heat exchangers, custom-designed valves, and other petroleum-processing equipment. **For more information write or call: ASHMORE, BENSON, PEASE & CO., Stockton-On-Tees, England.**

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EQUIPMENT MEN . . . in the News

Union Tank & Supply Names Christopher to Tulsa Area

CHRISTOPHER

William H. Christopher, Jr., has been appointed district sales manager in the Tulsa area for Union Tank & Supply Co. of Houston, it has been announced by A. F. Nixon, regional manager, at Fort Worth, Tex. Christopher has been a sales representative in the Tulsa area for about 2 years.

Union Tank & Supply Co. services the oil industry with bolted and welded-steel tanks and oil-processing equipment.

Gar Wood Names Hippler As General Sales Manager

The appointment of Harold H. Hippler as general sales manager has been announced by Milton G. Peck, vice president, sales, Gar Wood Industries, Inc. Hippler has been associated with Gar Wood Industries since 1924 and has filled many important positions in the company's sales activity.

Hippler started with Gar Wood as a parts-department clerk. He has been manager of Gar Wood's truck-equipment sales branch in Boston and assistant branch manager at both Boston and Detroit. In 1949, he was appointed manager of Gar Wood's branch division composed of direct-factory truck-equipment sales outlets in leading cities throughout the U. S. In 1954, he was made assistant director of sales and service administration.

Happy Transfers Shelton To Wichita Falls, Tex.

Ben E. Shelton has been transferred from Kilgore, Tex., to Wichita Falls to head the North Texas-Southern Oklahoma district of the Happy Co., manufacturers and distributors of oil-field equipment and accessories.

B. E. SHELTON

R. F. SNOWDEN

He replaces Robert F. Snowden, who has been transferred to Cushing, Okla., as field salesman for the northern Oklahoma district.

Oil Center Tool Opens New Corpus Christi Plant

Oil Center Tool Co. has opened this new office and warehouse building in Corpus Christi, according to John Maher, O-C-T president. The new facilities have doubled the space occupied by O-C-T in the Corpus area and will mean improved service to customers in South Texas. Walter Burke is manager of the Corpus branch.

Hughes Opens Manufacturing Facility in United Kingdom

Hughes Tool Co., Ltd., has been formed to manufacture Hughes rotary rock bits in the United Kingdom and to facilitate delivery in the sterling areas. The new company is a wholly owned subsidiary of Hughes Tool Co., Houston.

M. E. MONTROSE

W. H. SIEMS

Officers and directors of the United Kingdom firm are: Fred W. Ayers, director, senior vice president, and general manager, Hughes Tool Co. and managing director of Hughes Tool Co., Ltd.; M. E. Montrose, director and vice president, sales, Hughes Tool Co., director, Hughes Tool Co., Ltd., and director Hughes Tool Service, Ltd., Canada; W. H. Siems, general sales manager, Hughes Tool Co., director, Hughes Tool Co., Ltd, and director, Hughes Tool Service, Ltd.; and R. G. Roberts, director, Hughes Tool Co., Ltd.

The government has recently completed an all-brick-and-steel factory building near Belfast, Scotland, which it is leasing to Hughes Tool for the manufacture of rock bits. The new plant contains about 86,000 sq. ft. of floor space.

All tooling for the factory is being done in the United Kingdom and bit parts are being made from steel produced in the United Kingdom. While production has been started, tooling is still in progress. All development work and engineering will be done by the parent company in Houston. Sales offices of the new firm are located in the Barclays Bank Building in London.

Oil Base Establishes Three New Bulk Plants

To expand distribution of Black Magic oil-base drilling fluid, Oil Base, Inc., of Compton, Calif., has established three new bulk storage plants in the Gulf Coast area. The plants are

located at Alice, Tex.; Lafayette, La., and Harvey, La.

Vacuum and tanker trucks are available from these points for delivery of drilling fluids in premixed form to the rigsite on a 24-hour schedule.

Emsco Makes Spray Asst. Manager, Machinery Sales

Leonard Spray of Emsco Manufacturing Co. has recently been promoted to the position of assistant manager of machinery sales. After an interval of military service, he returned to Emsco as a member of the machinery sales department in 1947. He has held the position of district manager of machinery sales in San Joaquin Valley for the past 5 years.

Oilwell Names A. R. Smith To District Engineer Post

A. R. SMITH

Appointment of Albert R. Smith as district engineer, machinery sales and service at Shreveport, La., for U.S. Steel's Oil Well Supply Division has been announced by William Miskimins, central-Midwest area manager for Oilwell.

Smith was employed in 1948 by the division as its field representative at Shreveport. In 1950 he was transferred to Greggton, Tex., where he served as field representative. In 1953 he was transferred back to Shreveport and appointed assistant district engineer, machinery equipment sales, the position he held until his present appointment.

Utah Mud Names Herring to Head Rocky Mountain Areas

Utah Mud, Inc., has announced the appointment of Virgil F. Herring as manager of field operations for all Rocky Mountain areas, replacing E. J. Mayhew. Herring's experience in the oil fields dates from 1937.

Ralph LeMaster is field service engineer located in Price, Utah, operating with convenient mud and chemical stocks in that area. A. B. (Bud) Morris has been located in Grand Junction, Colo., with adequate stocks for servicing the western slope of the Rockies. And Lee M. (Tad) Crane represents Utah Mud at Aztec, N. M., as service engineer for the San Juan area. D. W. (Don) Cunningham is sales manager assisting in coordinating sales and service for the entire area.

Cal Metal Pipe Corp. Opens Houston Office

Cal Metal Pipe Corp. of Louisiana, with home offices in Baton Rouge, has announced the opening of a sales office in Houston.

A. H. Davis, sales engineer, will be in charge of the new Houston office.

Pennell Heads Oil Industry Sales for Owens-Corning

E. J. PENNELL

Edred J. Pennell of Tulsa has been appointed to the newly created position of manager of oil and gas-industry sales of Owens-Corning Fiberglas Corp. Pennell's appointment and the establishment of a special office, American Airlines Building, Tulsa, were so that Owens-Corning could better serve the oil and gas industry.

Pennell has been with Owens-Corning for 9 years and has a broad knowledge of all Fiberglas products. However, he will be dealing principally with anticorrosion products in his new position.

Pennell will have divisional responsibilities for pipe-wrap sales in 37 states east of the Rocky Mountains. He will report to W. J. Stroud, sales manager, weatherproofing products, Toledo, Ohio, general offices, and James J. Neal, Dallas, southern regional sales manager.

Hardy Made Sales Manager By Industrial Instrument

Warren G. Hardy, former sales engineer for M. N. Aitken Co., Houston, has joined the staff of Industrial Instrument Co., Odessa, Tex., as sales manager.

Hardy will head the I.I.C. sales force which has been enlarged following a recent nation-wide expansion program.

Hardy's experience includes 2 years as process engineer with The Texas Co. and 4 years as sales engineer for Minneapolis-Honeywell Corp.

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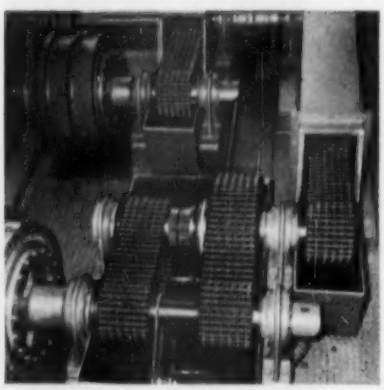

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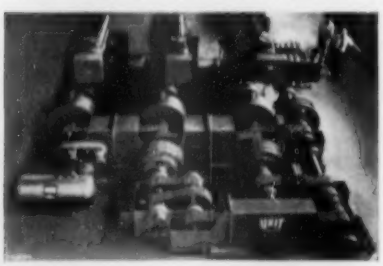

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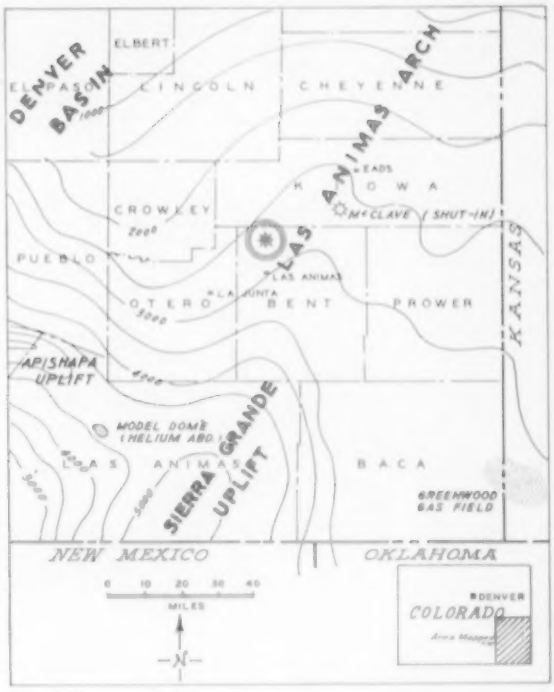
EXPLORATION

Another Frontier Falls Before the Drill

by Frank J. Gardner

"Who will first make the Las Animas arch produce?"

The question was asked in Albuquerque on February 23, 1954, at the fourth annual meeting of the Rocky Mountain section of the A.A.P.G. Max L. Krueger, in his keynote speech, was prodding his fellow rockhounds to greater exploration efforts. He threw a series of such questions to the convention as examples of unconquered frontiers in the Rocky Mountain oil search.



First commercial production for the Las Animas arch of southeastern Colorado is indicated at Stansbury 1 Cordes and Oberlander (circle). Contours on top Permian adapted from USGS Oil and Gas Investigations Map OM 135.

An independent operator . . . The question was answered last week. M. J. Stansbury, an independent operator from Bakersfield, Calif., was preparing to dually complete the first commercial well on the great arch that plunges northeastward through southeastern Colorado. He had carried his well, the 1 Cordes and Oberlander (21-21s-51w, Bent County, Colorado) to 5,544 ft., and made at least seven drill-stem tests before deciding to complete in two lower Pennsylvanian sands. On a 52-minute test of Atoka (?) sand at 4,625-45 ft., the operator was rewarded with gas to the surface in 3 minutes, flowing at maximum volume of 2,000 M.c.f. per day, with a spray of oil. Final recovery showed 210 ft. of 36.4° oil and 160 ft. of mud and oil-cut mud, with flowing pressures 170-300 psi. and shut-in pressure of 1,500 psi. in 15 minutes. On a later test, this horizon is reported to have tested at 40 bbl. of oil and 800 M.c.f. gas per day.

After deepening to a final 5,544 ft., Stansbury set casing and perforated opposite Keyes-basal Morrow sand at 5,208-27 ft. On a test there, gas flowed in 11 minutes. Gages were small, however (50 to 139 M.c.f. per day) and mud-acid treatment was applied. This increased the flow to 700 to 1,800 M.c.f. daily, and prompted the decision to make a dual completion.

Smashes a frontier . . . Testing is still going on at this discovery, and details on final completion flows may not be made public for some time. But its importance as a frontier smasher will rank it as one of the top Rocky Mountain exploration events of the year. Numerous wildcats over Las Animas arch have reported showings of oil and gas in years past, but none have produced commercial flows. Continental Oil Co. 1 McClave, 15 miles northeast of the Stansbury well (see map) made a very small gas well in 1952, but was shut in as noncommercial after registering a flow of 357 M.c.f. gas per day from Morrow sand at 4,870-90 ft. That test probed 94 ft. into the Bonneterre-Cambrian in reaching total depth of 5,914 ft. and was the first sign of success.

The subsurface nature of this large regional arch is vaguely known from the meager amount of drilling that has been done over it, but it is believed to harbor strat traps in the Paleozoic rocks that could conceivably hold sizable oil and gas pools. Every student of the structure is convinced of its potentialities, but up to now, nobody's been able to turn the trick of discovery.

Las Animas is a broad anticline that persisted all through Paleozoic time. In the Permian and Cretaceous rocks near and at the surface, it is well defined, and appears to be a spur plunging northeastward away from the Sierra Grande uplift (see map). In the deeper Mississippian rocks, however, it plunges southwestward and a saddle lies between it and the uplift. It is known to have been a clearly defined anticline by late Des Moines time and seems to have been accentuated by structural adjustments in late Pennsylvanian and Permian time. Subsurface correlations indicate 300 to 350 ft. of relief on the top of the Ordovician toward the end of the Permian. Before the Mesozoics were deposited, these studies indicate an eastward tilting and a truncation of the younger Permian strata. At the present time, structural relief on top of the Ordovician is about 750 ft., indicating a large amount of new movement during Cretaceous and post-Cretaceous time.

Skelly Oil Co. 1 Hankins, a wildcat in southeastern Baca County low on the southeastern flank of the arch, found a complete sequence of Paleozoics 5,500 ft. thick. The section was similar to that in southwestern Kansas, and included Permian, Pennsylvanian, Mississippian, Ordovician, and Cambrian rocks. On the crest of the arch, however, almost three-fourths of this sequence is absent. The Mississippian, Viola, and Simpson rock groups are absent on the west flank, but present on the east flank. These missing rocks are thought to wedge out somewhere on the eastern flank of Las Animas. If so, they should hold great promise as oil and gas traps.

And needs a challenge . . . Very few wells have been drilled in this remote country, and until more drilling is done, Las Animas holds its secrets to itself. A few successful wildcats will stimulate the exploration effort that is needed to unlock those secrets. The Stansbury discovery is no world beater productionwise. But the crop of six or eight new wildcat locations that have followed it is evidence enough of its effect explorationwise. It is an encouraging sign and a pretty good indication that Max Krueger's challenge has not gone unheeded.

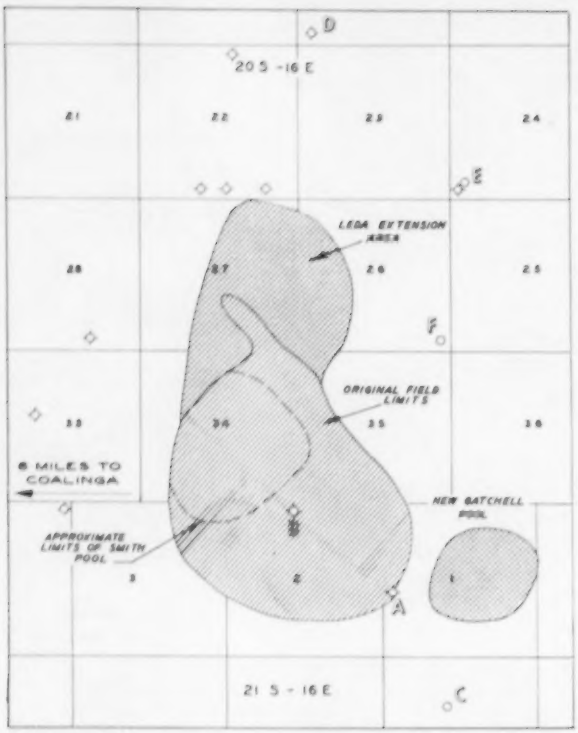

20 S - 16 E
LEDA EXTENSION AREA
ORIGINAL FIELD LIMITS
6 MILES TO COALINGA
NEW BATCHELL POOL
APPROXIMATE LIMITS OF SMITH POOL
21 S - 16 E

Fig. 1—Spurred by new finds in and adjacent to the field, exploration at Guijarral Hills is expected to remain active for months to come.

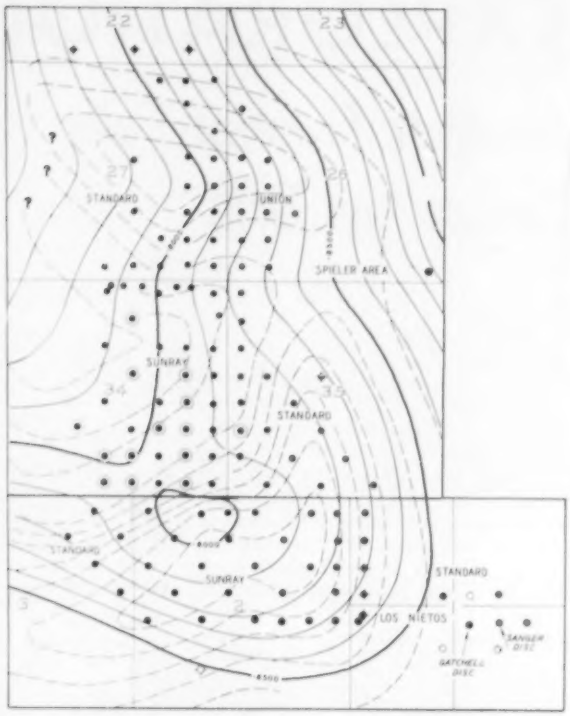


Fig. 2—Structural and sand-thickness map of the Leda sand, the field's most important zone. Contours are on top of sand.

Strat-Trap Strikes Revive an Old Field

. . . daily production climbs from 3,800 to 15,000 bbl. in 18 months

by D. H. Stormont
West Coast District Editor

GUIJARRAL HILLS field, on the southeast flank of a large anticlinal structure with which several Coalinga fields are associated, is scoring an impressive comeback.

Discoveries made in and adjacent to the 7-year-old Fresno County field have quadrupled its production. During January 1954 its output was 3,800 bbl. daily. Today it is around 15,000 bbl., about the peak reached in June 1950, when development was at its height.

Much of the new production is due to an extension of the Leda sand (lower Miocene) on the north edge of the field. The 38 wells completed there in the past 18 months are contributing more than 7,000 bbl. of the increase.

New pools discovered since the first of the year probably will boost oil production higher. Three new pools currently are being developed. One is a shallower sand passed up in favor of thicker pays. Another received its first producers at mid-June after first having been tested in February.

Because of these successes, exploration in the general area has been revived. The bulk of the work has been confined to the east and north of the field, as shown in Fig. 1.

Oil accumulation at Guijarral Hills is controlled by lensing and overlapping of the Miocene and Eocene sands on the southeasterly plunging Coalinga anticlinal nose. Several tests under way, or recently completed, are seeking either to extend productive limits or locate other stratigraphic traps along the flanks of the structure. This work is briefly summarized later on.

Leda extension . . . The new Leda pool added about 500 productive acres to the northern end of the original field. It added an estimated 10,000,000 bbl. to the field's reserves.

As shown in Fig. 1, original development of the 8,800-ft. sand was halted somewhat along the boundary between Sections 27 and 34. The pay section which was over 300 ft. thick at the crest of the pool had greatly thinned in this area. It also was low structurally. Standard Oil Co. of California completed the 354 well near the center of Section 27, but its performance did not justify further development.

Union Oil Co. 27 Spieler in SW Section 26 was drilled on the supposition that the Leda might be thicker and structurally higher than these projections indicated. Such proved the case. The wildcat was completed in January 1954 as a 1,200-bbl. producer through perforations at 8,810-53 ft.

Subsequent development, as seen in Fig. 2, showed the Leda thickened to more than 225 ft. Average thickness is less than in the older area but the sand is massive with fewer shale breaks. Permeabilities and porosities likewise

are higher, so it is expected that acre-foot yields from this new area will be higher.

A few more wells might be drilled in Section 27, but development is almost complete it appears. The Allison zone, an 8,300-ft. sand in which 28 producers were completed during the earlier development, is either missing or structurally low in the north extension area.

Gatchell discovery . . . Existence of prolific Gatchell sand (Eocene age) production at Coalinga Nose, 5 miles northwest, resulted in several tests being carried to the Eocene. Standard 1-A Bourdieu in NW SW 1-21s-16e (Well A) was drilled to 10,868 ft. in 1944 but found the Eocene sands nonproductive. Sunray Oil Corp. 41 Dessell (Well B) in NW NE Section 2, a 1950 wildcat, found only streaks of tight oil sand in the Eocene in drilling to 11,441 ft. Another 1950 test, Universal Consolidated Oil Co. 43 Orr (Well C) in SE NW 12, found the Gatchell wet in drilling to 11,450 ft.

On the possibility that the Eocene sands might be trapped down-structure from the Leda and Allison pools, Los Nietos Co. drilled 55 Bourdieu in NW SE Section 1. Though located only ½ mile east of the Standard failure, it was completed last February as a Gatchell sand discovery. It flowed 1,532 bbl. of light crude through a 26/64-in. choke, with perforations at 10,614-10,720 ft.

Since then the Union subsidiary has completed two 20-acre offsets in the pool. Standard completed one to the northeast as shown in Fig. 2. Both companies have two rigs working on development wells, and one each on a shallower pool.

While additional drilling may prove the find to be of major importance, later completions did not find as good a pay section as the discovery. It appears the pay will be much thinner, more spotty, and much tighter than at prolific Coalinga Nose field 6 miles northwest.

Los Nietos 75-1 Bourdieu, ¼ mile east of the discovery, found the pay some 100 ft. lower. It was completed flowing 1,126 bbl. of crude through a 1-in. choke at a depth of 10,730-10,850 ft. Production therefore may not extend much further to the southeast.

Sanger sand . . . In drilling the Eocene discovery and in two subsequent wells, a likely sand was encountered at about 8,300 ft. In Standard 564 1-H it tested for approximately 1,000 bbl. daily, 31° gravity, before being drilled on to the Gatchell.

First production was not until mid-June, however, when Los Nietos 65 Bourdieu and Standard 54 1-H were completed. The former found the sand at 8,380-8,447 ft. and the latter at about 8,360-82 ft. The lenticular sand reportedly was missing in Standard 573 1-H and in Los Nietos 44 Sanger.

Smith sand . . . In developing the older portion of the field, some of the wells in Section 34 encountered a prospective oil pay about 300 ft. above the Allison zone. Electric logs and formation tests indicated it would be commercially productive. But all wells passed it up in favor of the Allison and Leda zones.

Discovery of the Sanger zone, which is the geologic equivalent of the Smith sand, led Sunray Mid-Continent Oil Co. in late April to plug back 76 Fred Smith. The sand was much more prolific than suspected. The well rated an initial production of 516 bbl. of 35°-gravity crude through perforations at 7,885-7,908 ft.

Since then, 12 other subcommercial Allison (or Leda) wells have been plugged back and completed in this zone (see Fig. 2). The work has shown

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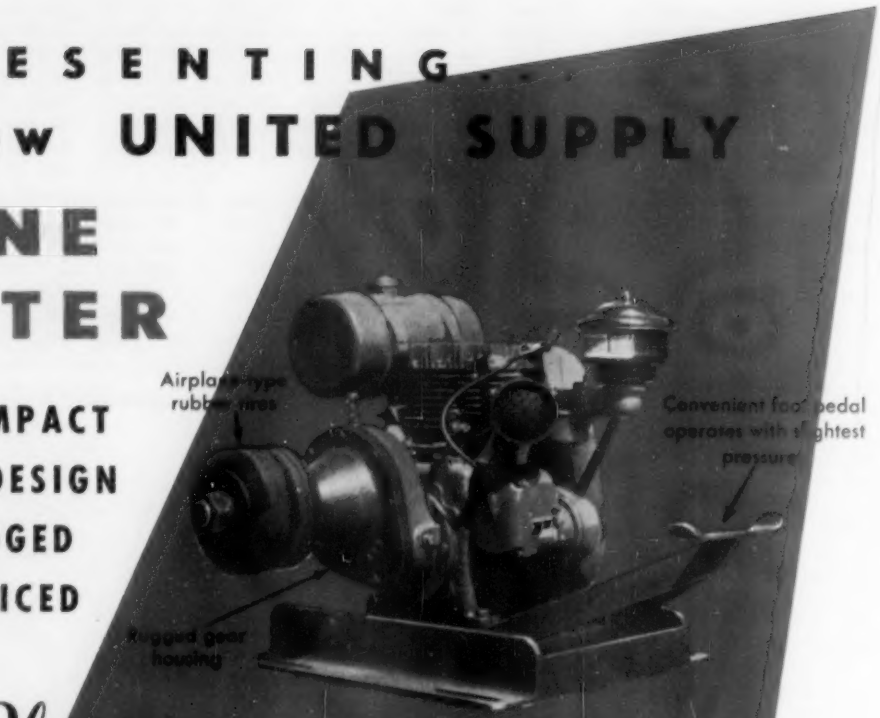

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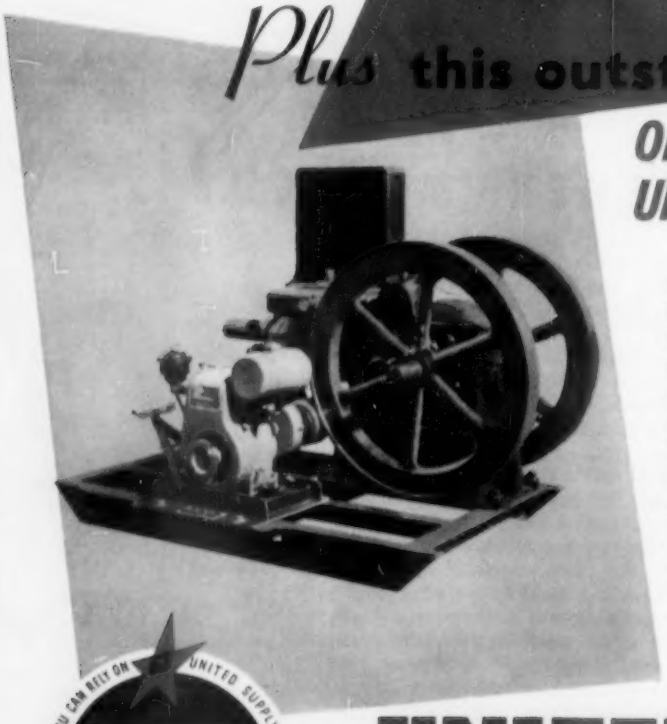

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the pay to be as much as 35 ft. thick at some locations. Average thickness is about 15 ft.

A few more producers are expected to be recompleted in this zone but it probably will not exceed 200 acres in size. Most of the wells had initial productions of 400 or 500 bbl. daily. They are not expected to be very long-lived, however.

Exploratory wells . . . Success in locating these traps has stimulated the search for similar pools. Recent dry holes drilled in this program are shown in Fig. 2. Most recent failure was Union Oil Co., Oper. 8-14 Helm Co. (Well D) in SW SW Section 14. It was abandoned in June at 9,578 ft., short of any Eocene possibilities.

Two wildcats which will do much to determine if the Eocene will trend northward—as it does in the Coalinga Eastside area—are under way in Sections 24 and 26. Santa Fe Drilling Co. 27-X (Well E) was reportedly drilling ahead at about 10,800 ft. The Texas Co. 1 Spieler (Well F) was started early in June, with an Eocene objective at 11,000 ft.

Exploration Highlights

MID-CONTINENT

NORTH TEXAS

Foard County Caddo Discovery Completed

Lucerne Corp. 1 Rasberry, in northwestern Foard County, has been completed as a good flowing discovery from Caddo limestone. Potential was 143 bbl. of 40° oil, with no water, through 18/64-in. choke. Flowing tubing pressure was 350 psi. and gas-oil ratio was 261:1. Production was from open hole at 6,137-60 ft.

Location in Section 26, Block A, SPRR Survey, is 9 miles northwest of Crowell, and 3 miles south of Caddo production in Canal Creek field. The well was originally drilled dry to 5,736 ft.

Extension Test Flowing

Poe Oil Co. 1 Liles, 4 miles southwest of Weinert in northeastern Haskell County, and over 1 mile southeast of similar pay, has been completed as a flowing Strawn well.

Daily potential through 14/64-in. choke was 123 bbl. of 35° oil, with gas-oil ratio of 450:1 and flowing tubing pressure of 110 psi. Pay was perforated at 4,755-63 ft. Total depth was 5,125 ft. Location is in the C. Calliott Survey.

Stevens Wildcat Flows

Olsan Brothers, Inc., and Leo Vessemmier 1 Liles, 5 miles northeast of Breckenridge in Stephens County, flowed oil on a drill-stem test in the Marble Falls at 4,216-22 ft. On the test, oil flowed in 1 hour and 10 minutes, amount not estimated, and recovery in the pipe was clean oil. A previous test at 4,202-09 ft. also made a heavy flow of gas and had oil to the surface in 37 minutes, but was not flowed to test.

OKLAHOMA

Simpson Sand Discovery Reported in Woods County

Woods County in northwestern Oklahoma has an indicated successful Simpson sand discovery at Amerada Petroleum Corp.'s 1 Farris, SW NW 21-24n-13w.

The operator ran a drill-stem test at 7,425-42 ft. with no recovery details reported as yet. Earlier the Hunton lime proved to be commercially promis-

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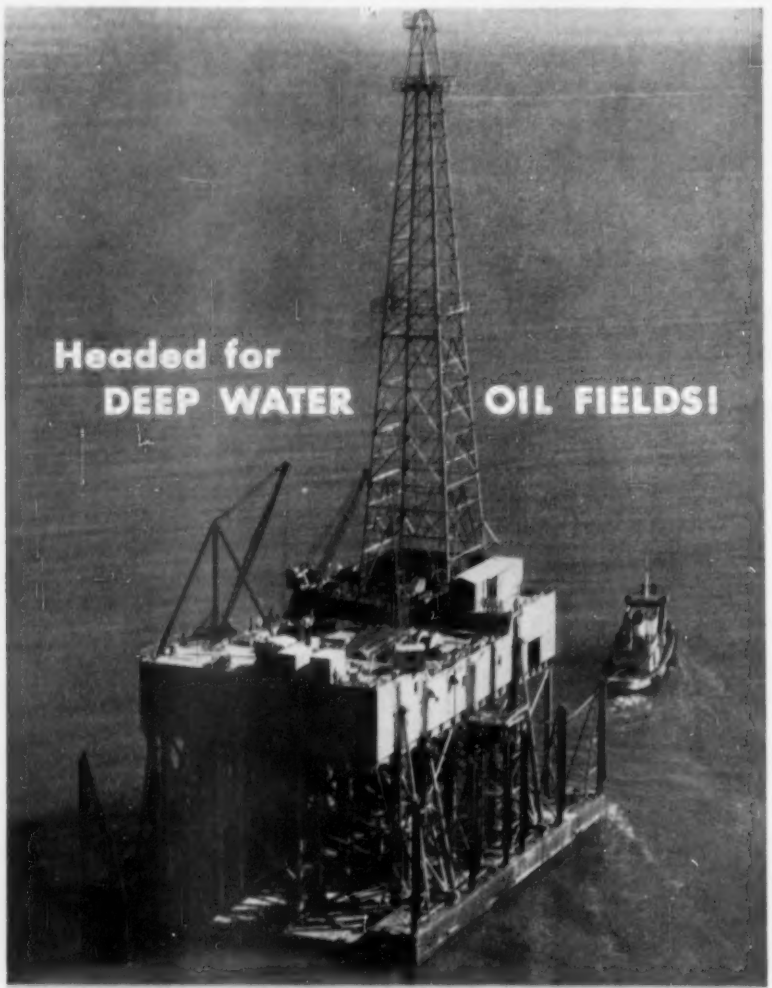
ing on a test at 7,125-40 ft. Gas flowed at 2,000 M.c.f. per day with some condensate (60° gravity). This newest Woods discovery is about 30 miles southeast of Yellowstone field, opened in 1952 by Champlin Refining Co. in 17-29n-19w. It is about the same distance west of similar production in Grant and Garfield counties, Oklahoma. Successful completion of the Amerada discovery prospect would establish an Ordovician trend across a considerable portion of Northwest Oklahoma.

North Madill Report

Sinclair Oil & Gas Co. is nearing completion at field wells in Marshall County's North Madill field (Ordovician). The 2 Nunley in 15-5s-5e, flowed 366 bbl. of oil in 12 hours on 24/64-in. choke from perforations in the third Bromide sand and McLish sand at 6,142-6,655 ft. The McLish made 275 bbl. in 10 hours on 18/64-in. choke.

The 1 Olmstead in NW SE NE 16-5s-5e is testing in the first Bromide sand at 5,504-07 ft. and 5,512-17 ft. Perforations have also been made in the basal McLish at 6,383-6,407 and 6,419-27 ft.

The 1 Jacks in SE SE SE 9-5s-5e made an initial flow of 102 bbl. in 4 hours on perforations in the third Bromide and McLish sands. A third Bromide test made 351 bbl. of oil in 11 hours. The McLish flow was 359 bbl. of oil in 10 hours with 592 M.c.f. of gas.



Kermac 44, deep water drilling rig built by Ingalls for the Kerr-McGee Oil Industries, Inc., heads out into the Gulf of Mexico.

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KANSAS

Mississippian Strike Drills Ahead in Barber

Barber County has an indicated Mississippian success at Pickrell Drilling Co. 1 Forsyth, NW SW SW 17-32s-12w. Recovery on drill-stem test at 4,424-40 ft. was 150 ft. of heavy gas-cut and slightly oil-cut mud. The well got 98 M.c.f. of gas on a test at 4,440-60 ft. The operator is drilling ahead below 4,684 ft. This wildcat discovery is located 1½ miles northeast of Medicine Lodge field.

Pawnee County's Larned Area Gets New Field

The area 2 miles east of Larned between Sweeney and Larned fields has a new discovery area. The wildcat strike is Harms-Burt-Oil Trading Associates 1 Spruill, NW NW SE 25-21s-16w. The well flowed 6½ bbl. of oil hourly, natural from the Arbuckle.

HUGOTON EMBAYMENT

SOUTHWEST KANSAS

Comanche County Gets First Oil Production

First oil production has been established in Comanche County, southwest Kansas. The significant well belongs to Sunray Mid-Continent and Trans Era Petroleum Co. It is the 1 Robinson, SE SE NW 5-31s-18w.

The Mississippian discovery is located 6½ miles north of the town of Coldwater, Kans., and is more than 10 miles from nearest production—Kiowa County. The operators are putting up pump after swabbing oil from perforations at 5,068-70 ft. The closest production is at Nichols field.

Southwest Exploration Shifts To Mississippian Prospects

The biggest exploratory activity in southwestern Kansas is centered in the Kiowa-Comanche county area. Objective of this search is the Mississippian formation.

A new Mississippian discovery is indicated for Kiowa County at Walt Kuhn-Innes 1 Bergner, 1 mile south of Havila and 5 miles northwest of Pyle-Miss field. The indicated hit is lo-

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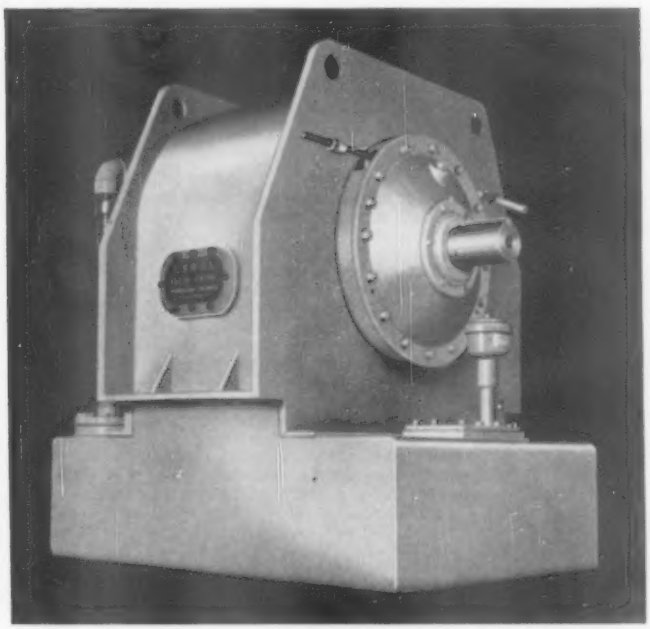

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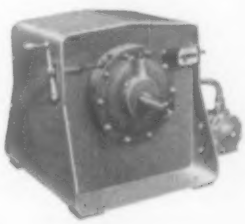
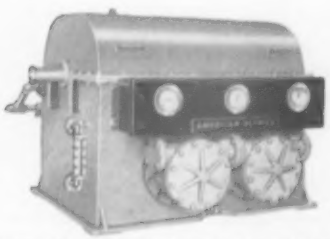


Type VS, Class-2, adjustable-speed Gýrol Fluid Drive. Speed range: 5 to 1. Six sizes, 7½ to 800 hp; speeds to 1800 rpm.



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cated in the SW SW SW 17-28s-16w. Gas flowed on a drill-stem test at the rate of 4,600 M.c.f. per day. The operator is coring in the Kinderhook-Mississippian.

Nichols field extension . . . Gulf Oil Corp. 1 Corse has extended Nichols field 1 mile to the southwest in NE NE SW 19-29s-18w.

The third well for this new field flowed 9,580 M.c.f. of gas per day on 1-in. choke. Other Mississippian tests are under way in Ness and Hodgeman counties.

SOUTHEAST COLORADO

Link Well Hinted at Baca County Wildcat

There are increasing prospects that Oklahoma's Keyes area and Kansas' Greenwood field may be linked-up at a Colorado wildcat in 6-35s-41w.

Superior Oil Co. 44-6 Stafford in SE SE NW of Section 6 flowed 1,150 M.c.f. of gas per day from the Marmaton lime on drill-stem test at 3,693-3,742 ft. The operator is running an electric log at total depth 4,717 ft. This promising wildcat is 2½ miles north of the Oklahoma line and 3½ miles west of the Kansas line, 5 miles southwest of Interstate-Morrow oil field (southwest flank of Greenwood-Topeka gas field). It is situated only 8 miles northwest of Keyes-Morrow gas field in the Oklahoma Panhandle.

TEXAS PANHANDLE

Dalhart Basin Confirmation Well Recovers More Oil

More Pennsylvanian granite wash oil has been recovered at the confirmation

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Seeco-Mul is the dried, flaked form of so-called "crude floating soap," a compound of the sodium salts of abietic, linoleic, and oleic acids together with quantities of wood tannins and lignins.

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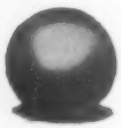

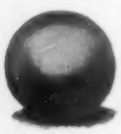

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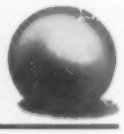

well to the Dalhart basin's only oil producing area. Standard of Texas 1 Alice Walker in Section 45, Block ITO, T&NO Survey, 11 miles southeast of Middlewater in south-central Hartley County, recovered 2,368 ft. of free oil on a test at 6,140-58 ft. Other oil recovery was made at 6,099-6,140 ft. The indicated strike is the confirmation well to Rehm granite wash field. Standard has about 350,000 acres in the Dalhart basin.

WEST TEXAS-NEW MEXICO

WEST TEXAS

Western Yoakum County Well Has Devonian Shows

A possible Devonian discovery was in the making, 9 miles west of Plains in Yoakum County, at Caroline Hunt Sands 1 Frank Walker, Section 363, Block D, John H. Gibson Survey.

Tentative top on the Devonian was 11,955 ft. on ground elevation of 3,745 ft. A 3-hour test at 11,860-11,970 ft. produced a strong blow at the surface, and recovered 450 ft. of oil and gas-cut

Caroline Hunt Sands 1 Walker recovered oil and gas-cut mud on a DST in the Devonian. Bronco field, to the west, is Devonian.

mud, 7,030 ft. of oil and water testing from 20-50 per cent oil; plus 3,070 ft. of slightly salty water. Flowing pressure ranged from 875-4,775 psi. Electrical surveys were run following the test.

Previously, this well developed oil shows in the Mississippian at 11,240-11,233 ft.

Reeves County . . . Gulf Oil Corp. and Phillips Petroleum Co.'s extension tests at the Toyah field have shown for confirmation pay from the Siluro-Devonian, and indicated a second pay zone, in the Pennsylvanian.

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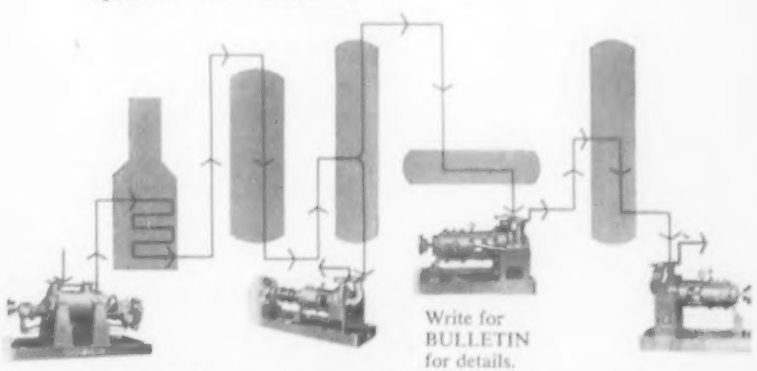

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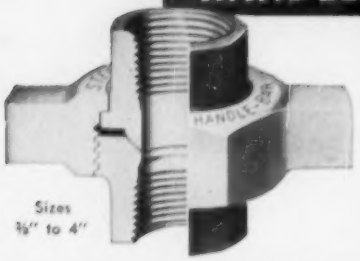

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flowed at the rate of 5,000,000 to 6,973,000 cu. ft. of gas a day while testing the Siluro-Devonian at 12,710-92 ft. There was no report of distillate. Surface flowing pressure was 270 psi.

The same operators' 3 Toyah Unit (formerly designated 1-MM State School Board), was producing gas at the rate of 6,500,000 cu. ft. daily from a Pennsylvanian sand at 11,120-11,372 ft. Surface flowing pressure ranged from 380-300 psi. over an 8-hour test.

Brewster County wildcat . . . Sun Oil Co. will drill a wildcat in west-central Brewster County, approximately 38 miles south and slightly west of the town of Alpine. The test was scheduled as 1 Mae McElroy, in 5-212-T&STL Survey. Projected depth is 7,500 ft. Location is 15 miles south of a 15,230-ft. dry hole drilled by Gulf Oil Corp.

Sheffield-Ellenburger offset . . . Standard Oil Co. of Texas 2 Canon, northeast offset to the firm's Ellenburger discovery, 10 miles southwest of Iraan, has made two shows of oil and gas in the Cisco. First test, from 6,670-6,701 ft., had gas in 5 minutes and flowed at the rate of 2,500 M.c.f. per day, through ½-in. top and bottom chokes. Tubing pressure was 480 psi. Recovery in the pipe included 135 ft. of white distillate, 69.6°.

Second test, still in Cisco lime, at 6,700-35 ft., had oil to the surface in 1 hour and 40 minutes. During the next 90 minutes the flow was 1.76 bbl. of 33° oil. Operators killed the flow with mud and drilled ahead.

GULF COAST

SOUTHWEST TEXAS

Dimmit Gets New Field

Sutton Drilling Co. has another Navarro oil discovery in northwestern Dimmit County. Its 1 Patterson, 10 miles northwest of Carrizo Springs in the J. A. English Survey, produced at the rate of 40 bbl. of oil per day through ½-in. choke, gaging 30 psi. on the tubing. Pay is perforated at 2,260-67 ft. Total depth is 2,975 ft.

Escondido Produces in New Atascosa Discovery

Escondido (Navarro) sand is being found productive in another Atascosa County area, 2 miles southwest of Pleasanton, where Security Drilling Co. and F. Ewing are completing their 1 Frank flowing at the rate of 140.25

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bbl. of oil per day through ⅛-in. choke.

Flow is from perforations at 4,636-64 ft. under 220-psi. pressure with gas-oil ratio of 600 cu. ft. per barrel.

Operators are near the pay horizon in their second well, 2 Frank, 933 ft. southwest of the discovery producer.

The area is 3 miles south of Imogene field with production from Edwards lime. It is designated as Velma (Escondido) field.

TEXAS GULF COAST

Workover Well Revives Abandoned Dinero Field

The abandoned Dinero field, in Live Oak County, is being revived with a well flowing at the rate of 160 bbl. per day through 7/64-in. choke. Flow rate is based on a 12-hour drill-stem test.

The well is a workover job by F. William Carr at 1 McGuffin, in the Jane Curry Survey, ¼ mile west of Dinero. It was plugged last April. Hole was deepened to 5,415 ft. from its former depth of 5,317 ft. Production is from perforations at 5,351-55 ft.

Victoria County Wildcat Tests Gas and Distillate

Morgan Minerals Corp. is opening a new gas-condensate field in northern Victoria County. Its discovery well, 1 Adcock, in the L. Navarro Survey, is about 3 miles northwest of Nursery, near the DeWitt County line.

Testing perforations at 8,412-26 ft., the well flowed under pressure of 2,290 psi. through ⅛-in. choke. Gas flow was ungaged. Condensate recovery was estimated at 25 bbl. per day. The well is shut in.

SOUTH LOUISIANA

New Multiple-Pay Field Discovered in Vermilion

Discovery of a new deep multiple-pay field is indicated in southern Vermilion Parish. Discovery well, drilled by Monterey Exploration Co. with Freeport Sulphur Co. and C. G. Glasscock as co-owners, is offshore in Vermilion Bay, 2½ miles south of the newly developing Live Oak field.

Operators have run pipe and are preparing to test a series of sand intervals below 13,400 ft. Hole was drilled to 13,831 ft. A string of 7-in. casing is cemented at 12,520 ft. with 5-in. liner to bottom.

Potentially productive sands were logged at 13,458-76 ft. (gas), 13,554-13,648 ft. (gas-oil contact 13,590 ft.), and 13,688-13,800 ft. (broken section with bottom 20 ft. oil saturated.)

MISSISSIPPI

Simpson County Wildcat Gets Rodessa Oil Shows

Promising oil showings have been encountered in a deep wildcat test Continental Oil Co. is drilling in northeastern Simpson County. Showings were in the Rodessa (Lower Cretaceous-Glen Rose) zone at 12,017-29½ ft. Drill-stem test was not run because of bad hole conditions in the Midway around 4,300 ft.

Rodessa zone was topped at 11,740 ft. (elevation 505 ft.). Showings extended through a 400-ft. section, but only the above 12½-ft. interval appeared to have sufficient permeability to be productive. Hole is being drilled and cored ahead.

The wildcat, 1 Central, is about 6 miles northeast of Mendenhall. It is about 40 miles northwest of Soso field, where prolific oil production is being developed in Lower Cretaceous, Rodessa, and Paluxy horizons.

New Wilcox Area Opened In Wilkinson Discovery

A new Wilcox-productive area is being opened about 5 miles northeast of Woodville, in Central Wilkinson County. Discovery well, drilled by Serio-

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Punches Oil Co. and T. J. Glennon, is perforated at 7,442-44½ ft. During pre-potential tests, it flowed at the rate of 150 bbl. of oil per day through 5/32-in. choke under pressure of 330 psi. Location of the well, 1 Whetstone, is in 31-3n-1w. It is 4 miles from other production.

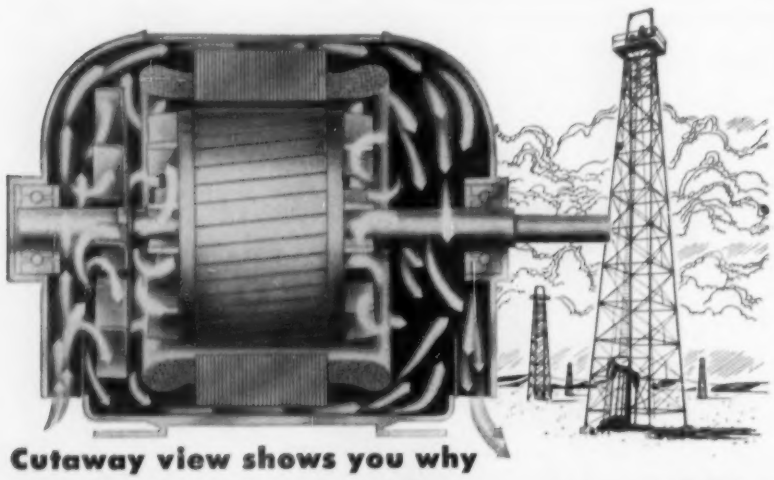
EASTERN INTERIOR

WESTERN KENTUCKY

Western Kentucky has its deepest producing well at George A. Hoffman 1 James W. Qualls, 21-M-24, 6 miles south of Sebree in Henderson County. The well is pumping 15 bbl. of oil per day from McClosky lime at 3,185-3,200 ft. Total depth is 3,212 ft.

ILLINOIS

In Washington County, Sun Oil Co. 1 Duerkob, SE SW SW 3-1s-4w, 3 miles north of Okawville and 10 miles northwest of Nashville, recovered 1,140 ft. of clean oil on a drill-stem test in the Silurian at 2,238-62 ft. Casing is set for testing at 2,251-62 ft. The wildcat is 2 miles from production.



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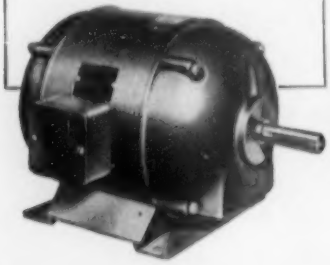

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OG

• In Christian County Lama Oil Co. 1 Hibbard, NW NE SW 3-13n-3w, 5 miles northwest of Taylorville, flowed 360 bbl. of oil per day on ¾-in. choke, natural. Pay is the Hardin sand at 1,728-1,803 ft. This wildcat strike is 3 miles from production.

ROCKY MOUNTAIN

NORTH DAKOTA

Bottineau County Strike Reports Good Hourly Flow

A flow of 16 bbl. of oil hourly on ¾-in. choke was reported at Lion Oil Co.'s good east-side Williston basin discovery, the 1 Skarphol, C SE NW 33-164n-77w.

The flow was from 2,971-79 ft. in the Mission Canyon. Lion's strike is located 7 miles east of Northeast Landa field and is the easternmost U. S. side Williston basin producing area. Lion has more than 100,000 acres under lease in the area. The company plans seven more wells in the region.

MONTANA

Bredette Area Discovery Completed in Charles C

The Bredette area discovery in Roosevelt County has been completed by The California Co. The 1 Grimm in the C NE SE 13-32n-49e, flowed 140 bbl. of oil daily on ⅛-in. choke. Production is from 6,537-45 ft. in the Charles C zone of the Mississippian-Madison. The 1 Tribal-13, a ¾-mile southeast confirmation try, is drilling at 4,093 ft. in C SE NW 19-32n-50e.

COLORADO

Lyons Discovery Makes 230 Bbl. on Pump Gage

A pump gage of 230 bbl. of oil in 15 hours was reported last week at The California Co.'s Permian-Lyons discovery at 1 Priddy, C NW SW 23-8n-66w, Weld County.

The perforations were at 9,201-10 ft. A confirmation well has been staked to this latest Permian discovery for the western Denver-Julesburg basin area.

WYOMING

Frontier Sand Discovery In Fremont County Finaled

A Frontier sand gas discovery has been completed by Atlantic Refining Co. in Fremont County. The 1 O'Connor in C NE SE 1-2s-4e, made 3,925

M.c.f. of gas daily and 10-12 bbl. of distillate. Production is from the first Frontier sand through perforations from 7,938 to 8,610 ft. in the sixth Frontier sand.

NEBRASKA

Kimball County Discovery Completed In the "J" Sand

Empire Drilling Co. has completed a "J" sand discovery in Kimball County at 1 Lukes, SW SW NE 31-13n-55w. The pump gage was 42 bbl. of oil per day with 14 bbl. of water. Perforations are at 6,523½-26½ ft. This new field is 3½ miles southwest of production in Enders field.

NORTHWEST NEW MEXICO

Wildcat Staked in Hospah Field

A Pennsylvanian test has been staked in Hospah pool, McKinley County. The new test is Great Western Drilling Co.'s 1 Hospah-Santa Fe in the E½ NW NE 1-17n-9w. The well will go to about 9,000 ft. It is the first deep test on the Hospah structure. Hospah produces Mesaverde oil at about 1,600 ft. It is south of the main producing portion of the San Juan basin.

APPALACHIAN

PENNSYLVANIA

In St. George district, Tucker County, West Virginia, Columbian Carbon Co., announced location for 1219 United States of America, tract 133-c wildcat, elevation 2,073 ft., Parsons Quadrangle, 3.05 miles south of latitude 39 degrees 15 minutes, 0.80 mile west of longitude 79 degrees 35 minutes.

- No. 1215 U.S.A., in this district is drilling at 1,829 ft.
- Beaver district, Nichols County, Nelson W. Taylor, Agt., for R. M. Brewster et al, located another 1 John & Ann Mearns, elevation 2,204 ft., Cowen Quadrangle, 2.10 miles south of latitude 38 degrees 25 minutes, 0.73 mile west of longitude 80 degrees 40 minutes.

EAST TEXAS

Oil Show in Limestone County Wildcat

Zephyr Oil Co. 1 Myrtle Norris, wildcat 4 miles west of Thornton, Limestone County, was reported making oil and gas on a test of a fault zone around 3,200 ft. Details of the test were lacking.

Previous tests of the Pettit at 5,413-33 and 5,454-64 ft., and also of the upper Glen Rose at 4,455-63 ft., with no commercial shows. Total depth was 5,553 ft.

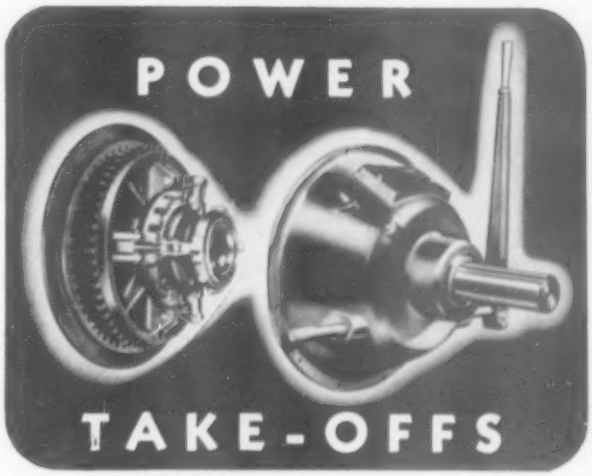
GREAT LAKES

MICHIGAN

Sun Oil Co. appeared to have the second Trenton oil well ready for completion in Freedom field, Freedom Township, Washtenaw County, at the west 40-acre offset to the discovery well which is and has been the lone oil well in the field.

Sun 1 Haab-Grau-Buss, SW NW SW 8-3s-4e, appeared to have showed a good Trenton pay section on one of three drill-stem tests. On test at 3,996-4,096 ft., a strong blow of gas showed to the surface in 2 minutes and gas flow was gaged at 104 M.c.f. Drill pipe carried 600 ft. of green oil, 240 ft. of gas-cut drilling mud, and 420 ft. of oil and gas-cut mud. Two other tests were run. One at 3,960-96 ft. showed for 2,860 ft. of gas and 55 ft. of gas-cut mud after a good blow was recorded

ROCKFORD



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at the surface in 45 minutes. Another at 4,096-4,155 ft. made only 150 ft. of gas-cut mud.

SOUTH LOUISIANA

New Completion Extends Producing Area at Lelux

Productive area of the new Lelux field, in Vermilion Parish, Coastal Louisiana, is being extended another ½ mile west with a new gas-condensate well completed by Amerada Petroleum Corp., principal operator in the area. The new well, 1 Vondenstein, flowed 139 bbl. of 49.3°-gravity condensate with 3,949,700 cu. ft. of gas per day on completion gage through 7/32-in. choke. Flowing pressure was 3,450 psi. Producing interval, in Miocene sand, is 10,754-66 ft.

OKLAHOMA

Summer Highlights of Expanding Oklahoma Activity

Exploratory and development activity are in high gear this summer, and the industry expects continued high-level programs during the last 6 months. Every section of the state is busy with important discoveries, extensions, and confirmation wells keeping the records hot.

South . . . One of the most important comparatively new producing areas in Oklahoma is Marshall County's North Madill-Ordovician field.

It is expected that the field will recover 1 million barrels of oil per well. The deep Ordovician play is centered in 5s-5e. The shallower Madill field in 5s-6e is coming into the Ordovician program also. New-pay discoveries in this Springer field are assured, making the entire area of considerable importance and profitable.

South Central . . . The Bradley district continues its lead in this section. Once again the Ordovician deep sands are the prime topic of exploratory conversation and thinking. Max Pray has the deepest oil producer in Oklahoma under test in this region (4n-5w).

Northwest . . . A Morrow sand gas-condensate reservoir seems assured for the Buffalo area in Harper County, far northwestern Oklahoma.

Sun Oil Co. got 7,000 M.c.f. of wet gas at their wildcat in 30-26n-24w. Simpson sand production is indicated at a wildcat in Woods County, Oklahoma, reviving the play that began 3 years ago when Champlin Refining Co. opened Yellowstone-Arbuckle gas-condensate field. Later, to the northeast in Kingman County, Kansas, another big Simpson discovery opened Orsemus pool, one of the exploratory highlights in Kansas in 1953.

Central . . . The Shamrock area in Lincoln County commands Central Oklahoma development. This area is fast developing with excellent flowing Prue sand wells in and around 22-17n-6e. Wildcat activity is keeping its usual high pace in this central county. Other high development fields are Agra, Mount Vernon, and the Chandler area.

West Lindsay Area Extended Again to West

Hart sand production is indicated at a west extension to the West Lindsay area in Garvin County. Superior Oil Co. 1-9 Chestnut, C NW NW 9-4n-4w, flowed 11 bbl. of 61.3°-gravity distillate in 4¾ hours on 19/64-in. choke with 1,248 M.c.f. of gas per day on perforations at 8,085-95, 8,137-50, and 8,176-84 ft.

Another well in the area, Cities Service Oil Co. 1 Shade-B, C NE NE 33-4n-4w, flowed 101 bbl. of oil per day on 10/64-in. choke from the Springer sand. Perforations were at 9,818-61 ft. The same company's 1 Pawley-Hutchinson, C NW NE 29-4n-4w, made 165 bbl. flowing per day on 14/64-in. choke.

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This well produced from Hart sand perforations at 8,750-8,883 ft.

Maysville Townsite Pool Extended With Two Wells

Garvin County's Maysville Townsite pool has been expanded with successful wells in C NW NW 15-4n-2w, and C NW NE 21-4n-2w.

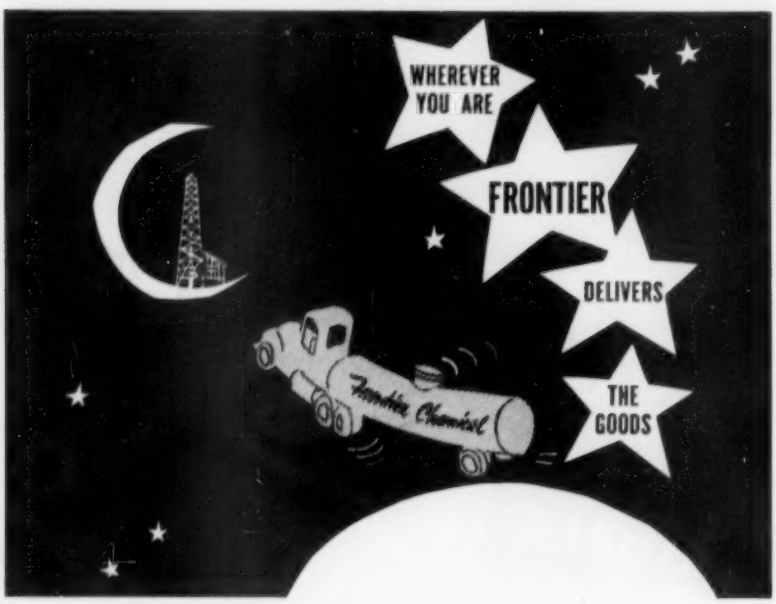
AnSon Petroleum Corp. moved Bromide sand production on the north side of the producing area at 1 Ledgerwood. The well flowed 189 bbl. of oil per day from perforations at 6,518-46 ft. on 18/64-in. choke.

Magnolia Petroleum Co.'s 1 Mays-Cooper in C NW NE 21-4n-2w, flowed 18.54 bbl. of oil in 1 hour on a drill-stem test in the first Bromide sand at 6,530-60 ft. Recovery was 880 ft. of oil, 39.2° gravity.

Ordovician Interest Up Again in Grady County

Max Pray 1 Billy, promising to become Oklahoma's deep oil producer at 13,873 ft., has stepped up the Ordovician play in Grady County.

This Bradley district well, located in the NE NW 3-4n-5w, made a drill-stem test of the first Bromide sand at 13,810-73 ft. More than 10,000 M.c.f. of gas per day was reported with a potential oil flow of 50 bbl. per hour estimated. The well is near the former record-holder for Oklahoma, Phillips 1 Steve, completed earlier this year.



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SOUTHWEST TEXAS

New T-E-A Well Confirms Upper Mirando Discovery

Skelly Oil Co. is confirming Taylor & Etheridge's recent upper Mirando oil discovery 20 miles south of Tilden, in McMullen County, in what has been named T-E-A field. Skelly's well, 1 Cooper, 2,113 ft. southwest of the discovery producer, is testing the pay at 1,993-98 ft. In a previous drill-stem test, open through ¼-in. and ⅜-in. chokes, it filled 290 ft. of oil and 10 ft. of oil-cut mud. The discovery well was completed as a 65-bbl. pumper from perforations at 2,006-09½ ft.

PACIFIC COAST

CALIFORNIA

Newport Fault Block Discovery

A new fault block discovery in the highly faulted West Newport field in Orange County has been made by C. D. Cunningham, whose 1 Sutherland in NE 12-6s-11w, flowed initially at the rate of 15 bbl. an hour of 20°-gravity clean oil through a 12/64-in. choke from perforations in the Middle Ashton sand at 2,725-60 ft. Total depth is 2,830 ft., with plug at 2,760.

Ventura County Tests

Sunray Mid-Continent Oil Co. has made a successful test of its 1 Sunray-Ohio-Kraemer-Del Cielo 2 miles northwest of Oxnard in NE 31-2n-22w, but is prospecting ahead before completing. With packer set at 13,690 ft. and tail pipe at 13,712, there was a net rise of 8,930 ft. (40 bbl.) of 29.3°-gravity oil, with no free water. Location is 2,400 ft. southeast of this operator's Ohio-Bailard-McGrath Completion.

One mile southeast, E. L. Doheny, Operator, has run two tests at 1 Doheny-Richfield-Laubacher. On a 5-hour test of the interval 11,610-27 ft., a fairly steady blow throughout was reported with recovery of 3,800 ft. of gassy mud grading to clean oil. On a later test at 11,180-11,200 ft., there was a gross rise of 5,380 ft., with top 540 ft. 24°-gravity oil.

Five miles east of Oxnard, Humble Oil & Refining Co. has abandoned 1

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OREGON

New Maps of Pacific Northwest Available

The Northwest Scouting Service in the Public Service Building, Portland 4, Oregon, has dry-hole maps available of western Idaho and portions of Malheur County, Oregon (Snake River Valley), and Washington available. The maps have been brought up-to-date as of July 1955. The township-range maps showing towns, counties, and dry holes drilled are of considerable interest to Pacific Northwest exploration.

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WESTERN CANADA

ALBERTA

Pakowki Lake Wildcat Shows For Bow Island Gas Strike

The New British Dominion Oil Co., Ltd.-United States Smelting & Refining Co. team has indicated gas success at the Pakowki Lake area wildcat in the southern part of the province.

The test, 11-17 Pakowki Lake, LSD 11, 17-4-8w4, has been plugged back from total depth to the Bow Island sand gas pay and crew is preparing for production tests. The well indicated about 20 ft. of gas-bearing Bow Island sand below 2,130 ft.

Parkland Area Wildcat Assured Gas Production

Texaco Exploration Co., Ltd.'s wildcat in the Parkland area is an assured gas producer, and initial potential tests indicate the well should be a better-than-average well, containing a highly desirable grade of very light naphtha.

The wildcat strike, Texaco-Baysell A-13-4 Pine Coulee, LSD 13, 4-15-28w4, earlier this year was a Madison discovery. On a series of tests in that pay the well made gas flows of 9,600 M.c.f. per day on 1-in. choke. An unofficial estimate gave the well an open flow potential of about 20,000 M.c.f. per day. Naphtha recovery on tests was from 15-20 bbl. per hour.

Successful Wildcats

SOUTHWEST TEXAS

Hidalgo County: Blaine Dunbar 1 Halstead et al Unit, Los Ejidos de Reynosa Viejo Grant. IP 102.6 BOPD, 7/64-in., 48.4°, perforations 7,945-49 ft.; and shut-in gas well, ungaged, perforations 6,872-96 ft. TD 8,011 ft. (New pay 7,945-49 ft. in Tabasco field.)

McMullen County: Bridwell Oil Co. 11 Brownson, W. H. Jacob Sur. 10, A-1028. IP 44,000 M.c.f. daily, open-flow potential, GCR 50 M.c.f. per barrel, 63.8°, perforations 6,047-54 ft. (lower Wilcox). TD 6,610 ft. (New field.)

TEXAS GULF COAST

Harris County: Slick Oil Co., Ltd., and Meredith & Co. 1 Weary, E. Farris Sur., A-278. IP 3,200 M.c.f. daily, open-flow potential, GCR 66 M.c.f. per barrel, 58.7°, perforations 7,533-38 ft. (Yegua); and 17,000 M.c.f. daily, open-flow potential, GCR 87.4 M.c.f. per barrel, 63.1°, perforations 6,806-11 ft. (Yegua). TD 8,018 ft. (Extends Aldine area.)

Nueces County: Glenn A. Martin and Kirk-

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If you are not fully acquainted with Geofrac-5 and Geofrac-15, ask your nearest Chemical Process Company station for more details. Or write to us in Breckenridge, Texas; we'll be glad to send you illustrated literature and other data without obligation.

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wood & Morgan, Inc., 1 Rivers, Sec. 26, Benton Pasture Subd. Shut-in gas well, ungaged, perforations 4,272-77 ft. TD 6,016 ft. (New field.)

San Patricio County: La Gloria Oil & Gas Co. 1 Kellerman et al, J. J. Borden Sur. 338, IP 85.51 BOPD (net) plus 10 per cent water, ¼-in., 22.3°, perforations 2,682-85 ft. (Heterostegina). TD 3,510 ft. (New field.)

EAST TEXAS

Anderson County: L. A. Douglas & L. A. Grelling 1 Bridges, R. Erwin Sur., A-262, 12 mi. SE Palestine, 2 mi. SE Camp Hill field. IP 59,000 M.c.f. gas, plus 33 bbl. 67.6° distillate per 1,000 M.c.f., Woodbine 5,348 ft., TD 5,882 ft., elev. 395 ft.

Panola County: Lyons, McCord & Logan 1 Burnett, TCRR Sur., A-26, 8 mi. SW Elysian Fields. IP 175 BOPD, 39°, TD 525 psi., GOR 600, Burnett sand of Travis Peak 6,258-63 ft. TD 6,460 ft., elev. 225 ft.

WEST CENTRAL TEXAS

Coleman County: Transcontinental Oil Corp. 1 Bex Cox, Sec. 7, HT&B Sur., ½ mi. SW Silver Valley. IP 84 BOPD, 12/64-in., TP 210 psi., GOR 1250, 40°, Grey sand 3,552-58 ft. TD 3,566 ft.

Parker County: W. J. & John J. Moran 1 Moody, Sec. 173, T&P Sur., 4 mi. NE Peaster. IPP 59 BOPD, 42°, GOR 800, Caddo 2,840-50 ft. TD 3,292 ft.

NORTH TEXAS

Wichita County: Jorig Drilling Co. 1 First National Bank Trustee, J. W. Massie Sur., A-181, 7 mi. NW Wichita Falls. IPP 138 BOPD, 42.5°, GOR 400, Canyon sand 2,970-3,003 ft. TD 5,301 ft.

Young County: Barron Kidd, Larson & Thomas 1 Lovern, AB&M Sur. 7, 6½ mi. NE Graham. IP 55 BOPD, 16/64-in., TP 50-75 psi., 41°, GOR 463, Buttram sand 2,190-94 ft. TD 2,207 ft.

Barron Kidd, Larson & Thomas 1 Rowan-Logan, J. W. Duty Sur., A-1831, 7 mi. NE Graham. IP 27 BOPD, 16/64-in., 41°, TP 50 psi., Buttram sand 2,179 ft. TD 2,183 ft.

Warren Petroleum Corp. 1 Graham estate, TE&L Sur. 2392, A-1109, 10 mi. SW Newcastle. IP 221 BOPD, 16/64-in., TP 600-870 psi., GOR 337, 40.8°, Caddo 3,740-50 ft. TD 4,686 ft.

SOUTHWEST NEW MEXICO

Lea County: Continental Oil Co. 1 Sanderson "B-9," 9-20s-36e. IPP 280 BOPD, 36°, TP 25 psi., pay 3,950 ft. TD 10,640 ft.

WEST TEXAS

Ector County: Humble Oil & Refining Co. 1 Barrow, 22-42-T1S-T&P, 10 mi. N Odessa, discovery, or 2-mi. extension to Ratliff pool. IP 561 BOPD, 32/64-in., TP 150 psi., GOR 872, 50°, Ellenburger top 13,554 ft., ground elev. 3,012 ft., top pay 13,578 ft. TD 13,678 ft.

Mitchell County: Gulf Oil Corp. 1 Chappell, 29-18-SPRR, 17 mi. S Westbrook. IP 69 BOPD, 14/64-in., TP 100 psi., GOR 1884, 42°, Mississippian perforations 7,775-95 ft. TD 7,898 ft., ground elev. 2,248 ft.

Terry County: The Texas Co. 1 Herring, 3-C38-PSL, 12 mi. SE Brownfield. IPP 77.43 BOPD, 36°, pay 9,446 ft. TD 11,694 ft.

Tom Green County: Union Oil Co. of California and Ray Smith Drilling Co. 1 Marschall, Sec. 11, B. M. Bullock Sur., 3 mi. SW Orient. IP 227 BOPD, ¾-in., TP 80 psi., GOR 170, 42°, pay 3,854 ft. TD 4,154 ft.

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ILLINOIS

Christian County: L. A. McElmurray 1 Hibbard, NW NE SW 3-13n-3w. IPF 503 BOPD, Hardin sand 1,782-1,803 ft., 39.3°, 1-in. choke. TD 1,805 ft. (Opens Kincaid pool).

Sangamon County: R. W. Schneider et al 1 Warrington, NE NE SW 24-14n-5w. IPP 11 BOPD, Silurian 1,683-92 ft. TD 1,720 ft. (Opens Glenarm pool).

SOUTH LOUISIANA

Jefferson Davis Parish: The Texas Co. 1 Goodwin et al, 28-7s-7w. IP 136 BOPD, 11/64-in., 29.7°, perforations 6,114-25 ft. (first Frio). TD 8,505 ft. (Discovery well Topsy area.)

Lafourche Parish: Gulf Refining Co. 3 Henderson et al, 24-22s-30e. IP 325 BOPD, 5/32-in., 35.3°, perforations 8,968-78 ft. TD 10,500 ft. (Extension, and new pay in West Bay field.)

St. Martin Parish: Austral Oil Exploration Co., Inc., 2 Trosclair, 64-9s-5e. IP 247 BOPD, 5/32-in., 31.9°, perforations 11,048-52 ft.; and 260 BOPD, 9/64-in., 30°, perforations 10,708-18 ft. TD 12,534 ft. (New pays in Anse La Butte field.)

NORTH LOUISIANA

Concordia Parish: Jett Drilling Co. 1 F. F. Yakey, 2½ miles northwest of Roseland field in C NE SE 25-4n-8e. IPF 124 BOPD, 9/64-in. choke, 42°, Wilcox sand 6,311-12 ft. TD 7,202 ft. (Discovery of Bougere field.)

Ouachita Parish: Zach Brooks Drilling Co. 1 Golson, 1¾ miles northeast of Cadeville in 19-17n-2e. IPF 7-10,000 M.c.f. of gas per day plus an estimated 60 BOPD, Cotton Valley "B" from open hole at 9,697-9,709 ft. TD 9,709 ft. (Discovery of Cadeville field.)

ARKANSAS

Lafayette County: McAlester Fuel Co. A-1 Strange, ⅝ mile northeast of production in C NE NW SW 4-16s-23w. IPP at rate of 117 BOPD, 20.1°, Tuscaloosa 2,600-08 ft. TD 2,700 ft. (Tuscaloosa discovery in North Stamps field.)

OKLAHOMA

Texas County: Republic 1 Burgge, C SW NE 20-6n-16eCM. IPF 126 BOPD and 21,000 M.c.f. of gas per day, Morrow sand 6,484-6,500 ft. Open flow. TD 7,006 ft. (Gas-condensate discovery).

KANSAS

Sumner County: Natural Gas & Oil Corp. 1 Norris, 2½ miles from production in SE SE NW 3-34s-2e. IPP 53 BOPD, Layton sand 2,785-88 ft., TD 3,770 ft. (Opens Norris pool).

NEBRASKA

Kimball County, Lukes: Empire Drilling Co. 1 Lukes, SW SW NE 31-13n-55w. IPP 42 BOPD, "J" sand discovery, new field. TD 6,610 ft. Skull Creek.

CALIFORNIA

San Bentio County: W. W. Holmes, Operator 2 Standard-McCray SW NE 25-16s-11e. IPP 12 BOPD 22° gravity, perfs. 1,604-1,631 ft., TD 1,722 ft. (New small field discovery.)

WYOMING

Fremont County, Riverton Dome South: Atlantic Refining Co. 1 O'Connor, C NE SE 1-2s-4e. IP 3,925 M.c.f. of gas per day, Frontier discovery. TD 9,398 ft. Morrison. Big Horn County, Manderson: L. J. Peterson 5 Wycol-Government, C SE NE 12-49n-92w. IPF 1,760 BOPD, Muddy discovery, new pay. TD 5,847 ft. Phosphoria.

SASKATCHEWAN

Socony-Central-Del Rio 28-2 South Ralph, LSD 2, 28-61-3w2. Mission Canyon oil well. TD 5,191 ft.

Imperial 5-7 Steelman, LSD 5, 7-4-5w2. Indicated Mission Canyon oil well. TD 5,565 ft.

ALBERTA

Socony-Seaboard 34-2 Violet Grove, LSD 2, 34-48-7w5. Cardium oil well. TD 4,545 ft.

LEGAL

Sealed bids on leases for oil and gas mining purposes will be received until 10:00 A. M. Friday, July 22, 1955, and opened at that time at the Anadarko Area Office, Anadarko, Oklahoma, covering allotted Indian lands located in Caddo, Comanche, Cotton, Grady, Kiowa, Stephens and Tillman Counties, Oklahoma. For information, write or telephone Mrs. Schroeder, Anadarko Area Office, Phone 788.

LEGAL

SEALED BIDS will be received until 2:00 P. M., Central Standard Time, July 29, 1955, and opened at that time in the Office of the Superintendent, Cheyenne River Indian Agency, Cheyenne Agency, South Dakota, for the leasing of 228 Units comprising 26,016 acres of Tribal land and 20,743 acres of allotted Indian land, located in Townships 9 to 17 North, Ranges 20 to 28 East, Counties of Dewey and Ziebach, South Dakota, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Cheyenne River Indian Agency at Cheyenne Agency, South Dakota, or The United States Geological Survey, Federal Building, Casper, Wyoming.

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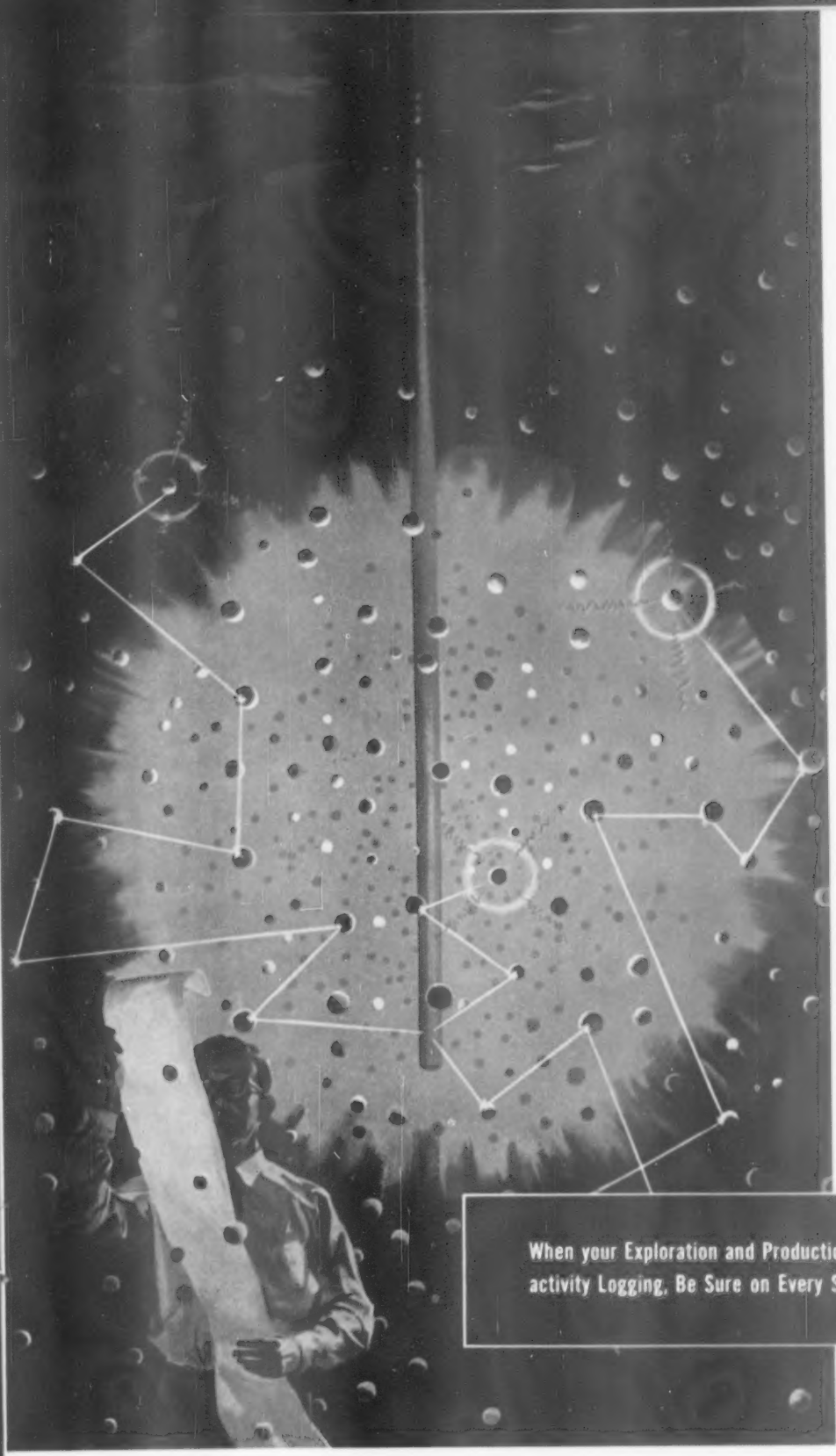

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PERSONALS

West Coast Veteran

Borden takes over top post with Sunray Mid-Continent

SUNRAY MID-CONTINENT'S newest vice president, F. W. (Dick) Borden, is a veteran of California oil operations. He has worked for a quarter-century in various fields in the state and is still manager of his company's West Coast operations in addition to being a top official.

As West Coast manager, Borden is following in the steps of other Sunray Mid-Continent officials who since have moved on to higher jobs. He succeeded R. E. Foss, now vice president and production manager. Foss had succeeded W. C. Whaley in the job when Whaley moved to Tulsa to become president of the old Sunray Oil Corp. Whaley now is president of Sunray Mid-Continent.

Borden is a native of Nebraska and was graduated from the University of Nebraska with an engineering degree. He went west in 1930, taking a job as oil field roustabout for Barnsdall Oil Co. He worked as a pumper, gager, and field clerk in various California areas until 1933, when he became gasoline absorption plant operator.

Borden later served as drilling and production engineer until June 1938, when he was promoted to a production foreman. In 1945 Barnsdall appointed Borden production superintendent of its Rancho San Francisco lease at Newhall. Three years later he became production superintendent and held that job when Barnsdall merged with Sunray.

Borden kept climbing with the larger organization. In May 1952 he became general superintendent of the California district and a few months later manager of the district. This year, after Sunray and Mid-Continent merged, he was named a vice president of the new company and manager of the West Coast division.

Borden's favorite hobby is studying relics and lore of the early American Indian. While he was superintendent of the company's Newhall - Potrero field and during the years he was stationed at Elwood, Borden scoured nearby hills searching caves for relics.

Borden was married to Miss Helen Elizabeth Adams on New Year's Day of 1931 at Omaha, Neb. The couple have two daughters, Barbara and Judy. The family now lives in Laguna Beach, Calif. Borden's parents, Mr. and Mrs. A. W. Borden, reside nearby.

Luther Tolbert, superintendent of Lone Star Gas Co.'s pipeline department, has retired. Tolbert joined Lone Star in 1920 and was named assistant district pipeline foreman at Lipan, Tex., the following year. He worked as district foreman in Mineral Wells and Joshua pipeline districts until 1928, when he was appointed assistant superintendent of the department. He became superintendent in 1948.

J. L. Coulson, formerly regional manager for Warren Petroleum Corp. at Abilene, Tex., has been made assistant

J. L. COULSON

A. J. EVANS

production manager in Houston. He has been succeeded at Abilene by **A. J. Evans,** formerly assistant regional manager and drilling superintendent. **G. R. Meyers,** formerly production superintendent for J. J. Lynn, has joined the Warren organization as assistant regional manager at Abilene.

S. Douglas Turner has been appointed manager of the Alberta division of the Canadian Petroleum Association. He succeeds **John W. Proctor** who recently was named general manager of the Alberta division of the association.

Franklin L. Kundahl, general manager of Crown Petroleum Corp., Hartford, Conn., has been named vice president. Kundahl has been president of the Connecticut Petroleum Association the past 2 years.

Philip M. Konkel has been appointed assistant chief geologist for Ohio Oil Co. Konkel started with Ohio Oil in 1940 as geologist at Marshall, Ill. Three years later he was transferred to Houston. In 1950 he was assigned to special geological and geophysical studies on the staff of the chief geologist in the general offices at Findlay, Ohio.

J. H. PITTINGER

J. H. Pittinger, Shell Oil Co., has been promoted to North Texas division exploration manager at Wichita Falls, succeeding **W. J. Amis,** who recently retired. Pittinger joined Shell in 1949 as a junior geologist and has been district geologist in Oklahoma City since last year. **R. K. Mann,** district geologist, has been transferred from Wichita Falls to the company's division office in Oklahoma City.

Harold B. Ward, independent oil operator of Tulsa, has been elected a vice president and member of the board of directors of Boren Oil & Gas Corp. of Wichita Falls, Tex.

J. G. Spratt, president of Trans Mountain Oil Pipe Line Co., Vancouver, has been named executive vice president and managing director of Triad Oil Co., Ltd. Spratt will continue temporarily as president of Trans Mountain until a successor is named.

J. C. Byrd, geologist, has joined Jones-O'Brien, Inc., Shreveport, La. Byrd was formerly on the geological staff of Midstates Oil Corp. and of Pan-Am Southern Corp. located at Shreveport.

E. G. Cole, formerly West Texas-New Mexico division geologist for Sinclair Oil & Gas Co. in Fort Worth, has been transferred to the company's New York headquarters on special administrative assignment. **W. D. McEachin,** district geologist at Midland, Tex., has been promoted to replace Cole in Fort Worth. **John K. Lydecker,** formerly division geologist at Midland

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PERSONALS

for American Republics Corp., has been named district geologist at Midland for Sinclair.

William D. Shea, petroleum geologist for Amerada Petroleum Corp. at Williston and Dickinson, N. D., has been promoted to the Denver office.

C. Arliss Watts has resigned his engineering position with A. O. Phillips, independent oil operator, to enter the petroleum consulting field in Corpus Christi, Tex. Watts was associated with Phillips 2 years, and prior to that was with Shell Oil Co. for 6 years.

Edgar J. Huff, district exploration geologist for Forest Oil Corp. at Midland, Tex., has resigned to open offices as a geological consultant at Midland. Huff served Forest in geological capacities over 5 years. Prior to joining Forest, he worked for Los Nietos Co. at Midland.

J. F. Bookout, Jr., district geologist with Shell Oil Co., has been appointed head of Shell's new district exploration and land office at Amarillo, Tex. **J. H. Freeland** has been named district landman. Other members of the Amarillo office include **L. E. Tjernagel** and **R. M. Lilly,** geologists; and **J. G. Voelm,** scout.

George Nolley has been elected vice president of Western Oil Transportation Co., Inc., and Permian Oil Co., both of Midland, Tex. Nolley was former manager of field operations of the crude oil supply division of Cities Service Oil Co., Bartlesville, Okla. He had been with the marketing and crude oil supply divisions of Cities Service for 14 years when he retired. He will headquarter in Fort Worth in his new association.

Clifford Smith, vice president and production manager of Delhi Oil Corp. prior to its merger with Taylor Oil & Gas Co., has been named vice president in charge of production for Delhi-Taylor Oil Corp. in Dallas. **Cecil D. Robinson,** formerly chief geologist and exploration manager for Taylor, is vice president of exploration for Delhi-Taylor. **Henry Kerr,** former production superintendent for Taylor, has been named general superintendent of production for Delhi-Taylor. **Harold Billingsley,** formerly with the Delhi geological department, has been named assistant chief geologist for Delhi-Taylor. **Louis Gross,** formerly Taylor chief process engineer at the Corpus Christi refinery, has been moved to Dallas as assistant chief engineer of Delhi-Taylor.

J. C. Webb and **R. F. Winston,** both of Lake Jackson, Tex., have been promoted to positions as engineering group leaders in the engineering department of Dow Chemical Co.

Stanley L. Westlake has been promoted by Magnolia Pipe Line Co. from assistant chief mechanical engineer to chief engineer in Dallas, replacing the late John G. Norton. **F. G. White,** formerly assistant division superintendent in Oklahoma City, has been promoted to division superintendent, succeeding **O. M. Joy,** who has retired. Westlake joined Magnolia after serving as a pipeline consultant for the old Petroleum Administration for War and as an engineer for other pipeline firms. White served Magnolia in supervisory capacities in Texas and Illinois before becoming assistant superintendent in Oklahoma City.

S. L. WESTLAKE

F. G. WHITE

Dick Mead, geologist with Shell Oil Co. at Casper, Wyo., has resigned to join William Ross Cabeen & Associates, consulting geologists and engineers, at Denver.

Clarence G. Matthews, drilling and production superintendent for New Superior Oils of Canada, Ltd., has joined General Petroleums of Canada, Ltd., as a drilling engineer.

Floyd Wright, Robert Manning, and **George Prigmore,** petroleum and uranium geological consultants at Lubbock, Tex., are opening a new office at Grand Junction, Colo.

Jose H. Pantin, Creole Petroleum Corp., has been named supervisor of surface geology in the geological department in Caracas, Venezuela, to replace **G. R. Heyl,** who has accepted a position as exploration manager of Standard Vacuum Oil Co. in Melbourne, Australia. **Lloyd A. Summers** has been appointed administrative assistant in the production department in Caracas. **Conrad H. Duncan** has been named acting assistant manager of the production department in Caracas on training assignment. Duncan temporarily replaces **W. J. Barnett,** who has accepted a position with an affiliate of Standard Oil Co. (N. J.), in Bordeaux, France.

H. F. Patterson has been named division geophysical supervisor for Stanolind Oil & Gas Co.'s Texas-Louisiana Gulf Coast division with headquarters in Houston. He succeeds **K. C. Thompson,** who has been transferred to Stanolind's central division office in Oklahoma City. Patterson had been district geophysicist at Midland.

Steve Hegion and **Ralph Atkinson** are partners in the recently incorporated petroleum consulting company, Hegion & Atkinson, Inc., at Virden, Man. Both left private consulting practices to form the new firm. Hegion had formerly been employed by Tide Water Associated Oil Co. in Regina. Atkinson had previously been with British American Oil Co., Ltd., first as a petroleum engineer and later as Manitoba production superintendent at Virden.

C. E. WEBBER

Charles E. Webber, formerly assist manager in Sun Oil Co.'s natural-gas and natural-gasoline division, has been appointed technical adviser to **John G. Pew,** Sun vice president in charge of production. **William Abnett** has been named assistant technical adviser. He formerly was special assistant to the late James E. Pew, manager of the natural-gas and natural-gasoline division.

R. M. Strom, formerly district geologist at Amarillo, Tex., for Cities Service Oil Co., has been transferred to Midland as assistant West Texas district geologist. He replaces **Clyde M. Pederson,** who has resigned to join the geological staff of Hancock Oil Co. at Midland.

A. E. Black has resigned as a scout for Phillips Petroleum Co. to open offices as an independent oil operator at Abilene, Tex. Black had been Phillips' oil scout at Abilene almost 17 years.

R. Meganck, managing director of British Petroleum Co., Ltd.'s associate, BP Belgium Societe Anonyme, has been appointed by King Baudoin of Belgium a "Chevalier de l'Ordre de la Couronne" in reconition of his meritorious activity in industry during the last 25 years. Meganck has been associated with Brit-

PERSONALS

ish Petroleum for that period, and has been managing director of BP Belgium since 1951.

R. W. Lewis, assistant district production superintendent for Magnolia Petroleum Co. at Kermit, Tex., has been promoted to assistant division production superintendent in Houston. **Kenneth Nelson,** production foreman for Magnolia at Tatum, N. M., since 1948, has replaced Lewis as assistant superintendent at Kermit.

Andrew Gilmour, chief supervisor in the geophysical department of Amerada Petroleum Corp., has retired after 33 years of service. Gilmour was hired by Amerada in London in 1922. After coming to America he worked in the company's Gulf Coast area, in California, Oklahoma, and Kansas. He was in Amerada's Tulsa office about 25 years.

J. E. Johnston, assistant to the general superintendent of the operating department of Oklahoma Natural Gas Co., has been promoted to superintendent of transmission, production, and engineering. **M. J. Peterson,** assistant chief engineer in the operating department, has been advanced to chief engineer. **J. H. Glamser,** assistant to the general superintendent, has been promoted to superintendent of distribution, utilization, and cathodic protection.

T. C. Borland has been named division production superintendent for Stanolind Oil & Gas Co.'s Canadian division, replacing **M. C. Hoffman,** who has retired. Borland joined Stanolind in 1935 and since then has advanced through engineering and supervisory positions. He served as field engineer at Turtle Bay, Tex., district engineer in Houston, division engineer for Gulf Coast division, and assistant division production superintendent for the central division before becoming Canadian division superintendent. Hoffman has been elected vice president of Continental Illinois National Bank & Trust Co. of Chicago. Hoffman was with Midwest Refining Co. and Montana-Dakota Utilities Co. prior to joining Stanolind in 1931. With Stanolind he held the positions of gas engineer, division engineer, chief production engineer, general superintendent, and Canadian division superintendent. As vice president and director of Stanolind's Pan-Am Southern Corp. during 1949-1954, he was in charge of that company's exploration, production, and pipeline activities.

Paul Andrews, Signal Oil & Gas Co., has been elected chairman of the Conservation Committee of California Oil Producers. Other officers elected at the committee's organizational meeting were **R. C. Gentry,** Standard Oil Co. of California, first vice chairman; **E. Robert Burns,** MacDonald & Burns, second vice president; and **C. W. Stephens,** Ohio Oil Co., secretary.

W. R. Chandler has been elected vice president of Trans - Arabian Pipe Line Co. Chadler joined Tapline in 1946. During construction of the line he was successively chief engineer, general superintendent of construction, and assistant general manager. He will continue to headquarter in Beirut, Lebanon.

William C. Soudriette of Chicago and **Harold W. Torgeson** of Bartlesville, Okla., have been appointed staff assistants to **William T. Cravens,** manager of Cities Service Oil Co.'s refining division at Bartlesville. Soudriette's new duties will concern refinery operations and research; Torgeson's will be in connection with lubricants manufacture and application.

Dal Clark, superintendent of motor transport for Service Pipe Line Co., has retired after 37 years with the company. He has been succeded by **Jack W. Foster, Jr.,** who will have the new title of mobile equipment supervisor. **Ray Harvey,** chief oil dispatcher, has also retired after 37 years' service and has been succeeded by **William B. Sikes,** assistant chief.

Dr. Rex E. Lidov has been appointed research associate in the research department of Brea Chemicals, Inc., subsidiary of Union Oil Co. of California. He will be responsible for several aspects of new product development from the company's raw materials. Dr. Lidov was formerly assistant manager of Shell Development Co.'s agricultural chemicals division in Denver.

Charles L. Suhr, former board chairman of Pennzoil Co., has been appointed chairman of the enlarged South Penn Oil Co. following the recent merger of the two firms. **George J. Hanks,** former South Penn board chairman, is now president of the firm. Other management appointments to the new firm include **R. W. Grunert,** former South Penn president, now senior vice president in charge of the South Penn division, and **W. S. Zehrung,** former South Penn vice president, now senior vice president of the Pennzoil division.

R. W. Gerhard has been appointed director of the coordination division in the distribution economics department of Standard Oil Co. (Ind.). Gerhard joined the company in 1944 as a chemical engineer and was supervisor of cost control in general office of the manaufacturing department prior to his latest appointment.

Phil H. Garrison has been named division geophysical supervisor for Stanolind Oil & Gas Co.'s division in Calgary. Garrison, who moves from Stanolind's central division office in Oklahoma City, will coordinate the company's geophysical prospecting program in Canada. He replaces **W. A. Matthews,** who is transferring to Stanolind's general office in Tulsa.

H. Alan Nelson has been engaged as chief petroleum engineer by Blackwell Oil & Gas Co. in Tulsa. Nelson has been associated with the petroleum engineering consulting firm of Ramsey, Nelson & Peterson, Inc., Oklahoma City. He will assume new duties with Blackwell August 1.

DEATHS

W. W. (Web) Wilson, founder and chairman of the board of Web Wilson Oil Tools, Inc., died July 3 in Los Angeles after a long illness.

William Shelton Gray, 58, vice president of Atlas Oil Corp., died June 29 at Bastrop, La.

William H. Noble, 82, former executive of The Texas Co., died July 2 in Fort Worth.

Eulus Alton Parker, 50, partner in Big D. Drilling Co., Cross Plains, Tex., was killed in an automobile accident July 2 near Abilene. Parker lived in Dallas.

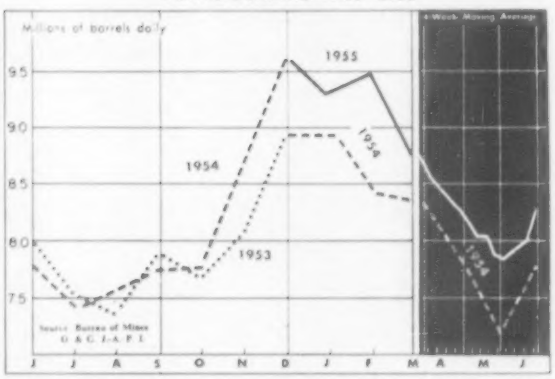
Burr Lambert, 57, Evansville, Ind., oil operator and drilling contractor, died recently at his home in Evansville.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,623,175	DOWN	1,250	UP	247,780
Crude stocks	273,405,000	DOWN	2,363,000	DOWN	4,481,000
Completions	1,123	DOWN	103	DOWN	85
Refinery runs	7,499,000	UP	35,000	UP	494,000
Gasoline stocks	159,611,000	DOWN	4,860,000	DOWN	4,935,000
Distillate stocks	99,981,000	UP	3,643,000	UP	13,216,000
Residual stocks	44,799,000	DOWN	785,000	DOWN	5,846,000
Four-product stocks	334,290,000	DOWN	1,235,000	UP	4,392,000
Total imports	831,500	DOWN	209,100	DOWN	116,600

TOTAL DEMAND – ALL OILS



Gulf Coast Districts Account for Large Part of Refining Increase

GROWTH in refining capacity on the Gulf Coast since 1941 has accounted for 35.7 per cent of the over-all expansion for the period. Refineries in the coastal districts of Texas and Louisiana represented 27.9 per cent of total capacity in 1941 and had climbed to 31.7 per cent of the total by the first of 1955. These data are based on operating capacities.

The largest percentage gain in capacity was in the Louisiana Gulf Coast district. Capacity at the start of this year was up 363 per cent over 1941. This gain raised the relative position of the district from 3.3 per cent of the total in 1941 to 7.9 per cent in 1955.

Also, operators in the Gulf Coast districts pushed refinery runs nearer to capacity during the first half of this year than in any other major refining area. Crude runs for the two districts indicate that the refineries were operated at 96.7 per cent of reported capacities.

Crude runs for all refineries in the country gained 5.9 per cent in the first half of this year. The Texas Gulf Coast district was up 9.4 per cent and the Louisiana Gulf Coast 14.8 per cent.

This full utilization of greatly expanded capacity on the Gulf Coast has been a factor in the rapid buildup of product inventories in the coastal districts.

Gasoline stocks on the Gulf Coast are up 4,000,000 bbl. over last year in contrast with a decrease in the national total of 3,500,000 bbl.

If the East Coast gains in distillate stocks are combined with the gains on the Gulf Coast, the over-all coastal increase amounts to 9,000,000 bbl. out of a total of 13,300,000 bbl. for the entire country. There was some buildup before the first of the year but part of the increase has been due to high runs first half of this year.

Refining trends by districts are shown in the accompanying table. The first column shows changes in operating refinery capacities between 1941 and 1955. Differences are in thousands of barrels daily. Percentage changes are shown in the second column.

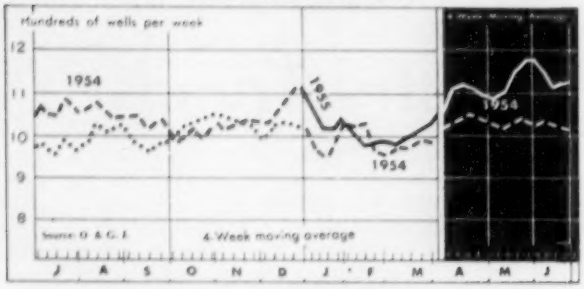
The percentage of refining capacity used was obtained by dividing first-half runs by capacity at the start of the year. Indexes of refinery runs, shown in the last two columns, represent comparisons for the 1947-49 period.

REFINING TRENDS

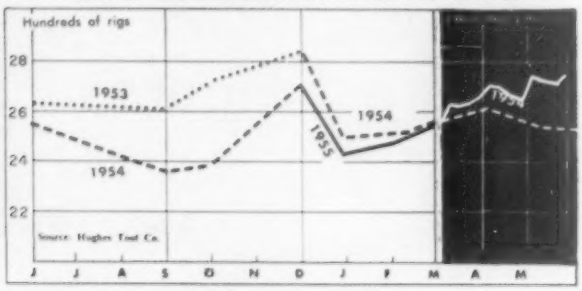
	Capacity changes 1941-1955		Per cent operated	Indexes of refinery runs, first half†	
	Volume*	Per cent	first half	1954	1955
East Coast	554.4	86.2	87.9	125	129
Appalachian 1	—2.3	—2.1	88.9	115	103
Appalachian 2	53.1	128.3	96.8	143	144
Ill., Ind., Ky.	779.2	117.1	93.6	146	153
Okla., Kans., Mo.	343.2	90.9	90.6	137	151
Inland Texas	60.0	27.1	90.7	106	110
Texas Gulf	890.5	86.5	95.3	130	142
Louisiana Gulf	499.1	363.0	101.3	135	155
N. La. and Ark.	21.9	27.4	85.3	116	116
New Mexico	15.3	206.8	87.0	164	172
Other Rocky Mtn.	184.3	180.2	86.4	158	165
California	489.9	64.1	82.8	121	122
Total U. S.	3,888.6	93.0	91.3	131	139

*Thousands of barrels daily. †Indexes based on average for 1947-49 equal to 100.

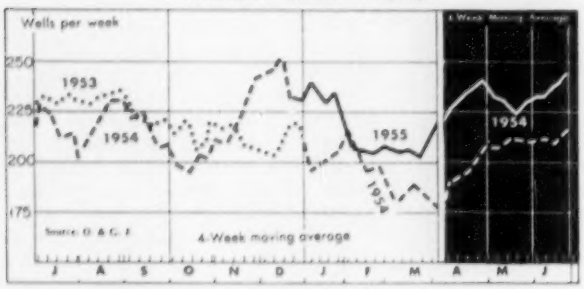
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	7-4-55	Change from 6-27-55	Change from 7-5-54
Gulf Coast	603	4	69
N. and W. Texas-New Mexico	883	22	57
Arkansas-N. Louisiana-E. Texas	159	—15	—17
Oklahoma	336	10	45
Kansas-S. Nebraska	186	6	13
Illinois-Eastern	143	—12	— 4
Rocky Mountain	273	8	21
Pacific Coast	151	— 2	21
Total United States	2,734	21	205
Western Canada	203	8	63

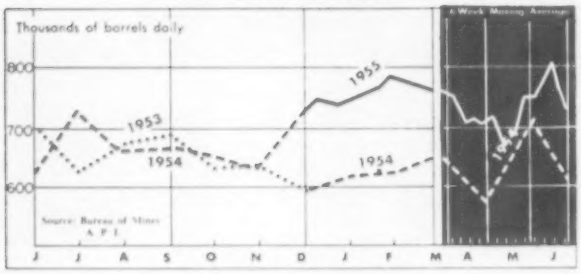
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JULY 2, 1955

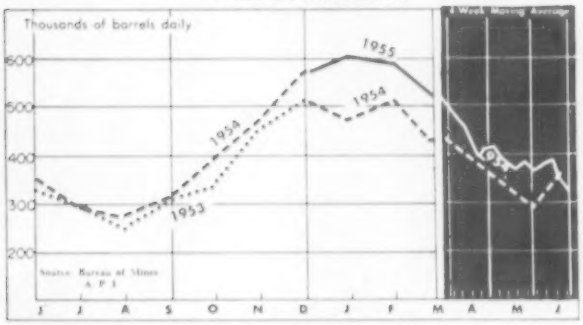
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1955	Cum. 1954	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1955: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	1	0	0	1	4,170	42	55	0	0	0	1	1	0	0	0	40	40
Arkansas	16	11	0	5	42,273	362	296	1	0	0	1	2	17	0	2	85	104
California	40	25	2	13	224,560	1,292	1,242	1	0	0	8	9	22	0	6	200	228
Colorado	20	6	0	14	103,603	689	661	0	0	0	13	13	24	0	17	342	383
Illinois	76	42	0	34	182,188	1,837	1,377	3	0	0	11	14	32	0	1	270	303
Indiana	12	2	2	8	21,581	380	406	0	0	0	1	1	8	0	0	160	168
Kansas	97	52	9	36	333,572	2,550	2,228	3	0	0	11	14	71	1	18	398	488
Kentucky	20	11	0	9	29,639	630	571	2	0	0	6	8	24	0	5	104	133
Louisiana	73	43	6	24	482,181	1,998	1,634	4	0	1	10	15	62	42	14	203	321
North	39	25	3	11	139,883	1,075	879	1	0	1	3	5	12	3	2	80	97
South	34	18	3	13	342,298	923	755	3	0	0	7	10	50	39	12	123	224
Michigan	8	1	0	7	27,962	257	281	0	0	0	5	5	6	0	0	100	106
Mississippi	7	2	0	5	39,496	241	197	0	0	0	1	1	9	0	0	86	95
Montana	3	1	0	2	17,630	154	137	0	0	0	2	2	4	0	1	44	49
Nebraska	16	6	0	10	90,199	357	179	1	0	0	7	8	19	0	0	144	163
New Mexico	40	19	15	6	203,198	772	521	1	0	0	5	6	18	1	6	60	85
Northwest	16	0	15	1	70,944	228	155	0	0	0	1	1	2	0	6	21	29
Southeast	24	19	0	5	132,254	544	366	1	0	0	4	5	16	1	0	39	56
North Dakota	4	1	0	3	20,078	112	128	0	0	0	0	0	1	0	0	19	20
Ohio	22	16	2	4	42,181	553	580	0	0	0	0	0	1	0	4	14	19
Oklahoma	229	140	12	*77	724,546	4,349	4,571	6	1	0	18	25	70	8	18	330	426
Pennsylvania-New York	23	6	7	†10	58,406	828	1,215	0	0	0	0	0	0	0	5	7	12
Texas	396	226	12	158	1,613,939	9,953	9,163	14	3	1	95	113	378	55	69	2,068	2,570
Southwest (1 & 4)	71	40	2	29	248,520	1,554	1,279	3	1	1	19	24	48	17	22	401	488
Gulf Coast (2 & 3)	49	19	6	24	301,109	1,281	1,325	0	1	0	16	17	42	29	24	323	418
East (5 & 6)	22	12	3	7	107,243	488	483	1	1	0	5	7	15	4	3	153	175
North Central (7-B & 9)	160	83	0	77	470,399	3,657	3,449	6	0	0	40	46	195	0	7	800	1,002
West (7-C & 8)	83	62	0	21	435,587	2,490	2,148	4	0	0	15	19	75	1	6	379	461
Panhandle (10)	11	10	1	0	51,081	483	479	0	0	0	0	0	3	4	7	12	26
Utah	0	0	0	0	0	37	33	0	0	0	0	0	3	0	2	22	27
West Virginia	7	0	6	1	15,201	297	268	0	0	0	0	0	0	0	8	10	18
Wyoming	13	5	1	7	60,324	381	699	1	0	1	2	4	12	0	4	78	94
Miscellaneous	0	0	0	0	0	17	82	0	0	0	0	0	0	0	0	13	13
Total United States	**1,123**	615	74	434	4,336,927	28,088	26,524	37	4	3	197	**241**	781	107	180	4,797	5,865
Total previous week	1,226	682	71	473	4,749,204			38	3	8	219	268	744	103	177	4,600	5,624
Total July 3, 1954	1,208	671	97	440	4,750,554			39	2	13	193	247	730	78	192	4,398	5,398
Western Canada	63	41	2	20	246,134												

Service wells included: *2, 16.

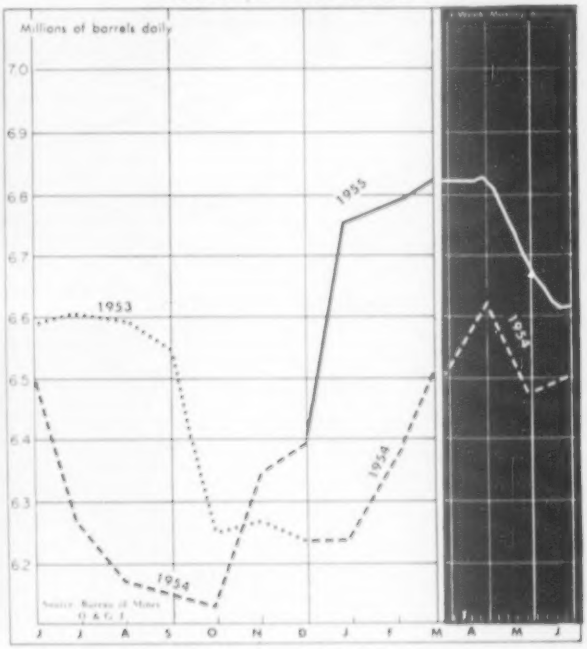
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE OIL PRODUCTION

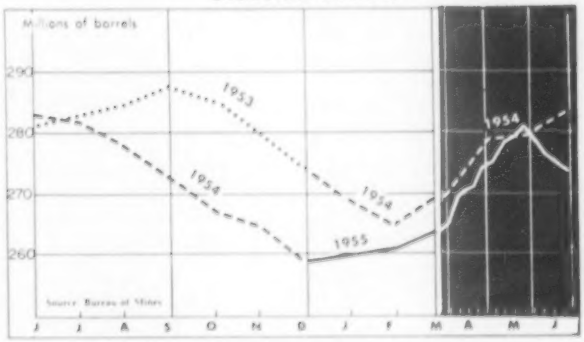


DAILY AVERAGE PRODUCTION FOR WEEK

	July 2			June 25
	Crude oil	Lease condensate	Total	total
Alabama	3,500		3,500	3,600
Arkansas	76,550	450	77,000	77,250
California	973,200		973,200	973,200
Colorado	145,600		145,600	140,100
Eastern	46,500		46,500	46,500
Florida	1,300		1,300	1,300
Illinois	234,800		234,800	233,800
Indiana	29,900		29,900	29,900
Kansas	306,300		306,300	321,000
Kentucky	40,500		40,500	40,200
Louisiana	643,400	48,000	691,400	689,700
North	115,400	3,000	118,400	116,700
South	528,000	45,900	573,000	573,000
Michigan	31,000		31,000	31,300
Mississippi	94,150	4,150	98,300	98,300
Montana	46,100		46,100	45,600
Nebraska	29,200		29,200	29,600
New Mexico	221,900	3,550	225,450	225,450
North Dakota	26,900		26,900	20,900
Oklahoma	545,600		545,600	547,100
Texas	2,733,200	47,325	2,780,525	2,780,525
Dist. 1	53,000	550	53,550	53,550
Dist. 2	136,700	7,500	144,200	144,200
Dist. 3	421,000	21,500	442,500	442,500
Dist. 4	230,800	5,200	236,000	236,000
Dist. 5	45,500	400	45,900	45,900
Dist. 6	115,800	4,800	120,600	120,600
East Texas field	207,300		207,300	207,300
Dist. 7-B	141,000	50	141,050	141,050
Dist. 7-C	183,000	4,600	187,600	187,600
Dist. 8	906,000	2,100	908,100	908,100
Dist. 9	204,600	500	205,100	205,100
Dist. 10	88,500	125	88,625	88,625
Utah	5,500		5,500	5,600
Wyoming	284,300		284,300	283,200
Others	‡300		‡300	300
Total U. S.	6,519,700	103,475	**6,623,175**	6,624,425
Change from previous week, down			**1,250**	
Canad	† 355,200		†355,200	†375,550
Total U. S. production January 1-July 2			1,230,570,900 bbl.	
Same period last year (crude plus cond.)			*1,180,260,085 bbl.	

*Includes 18,656,850 bbl. condensate. †Week ended previous Monday. ‡S. D. 100, Nev. 200.

CRUDE OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

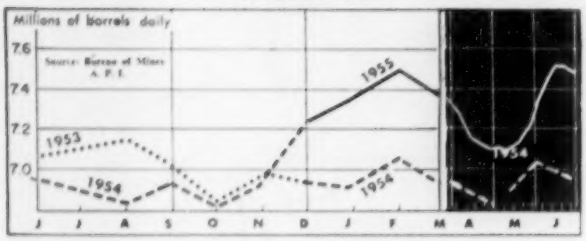
(Thousands of barrels)

	June 25, '55	June 18, '55	June 26, '54
Pennsylvania Grade	2,834	2,809	3,286
Other Appalachian	1,970	1,937	1,856
Illinois, Indiana, Michigan	11,690	11,939	13,043
Nebraska, North Dakota	2,034	2,025	(‡)
Kansas	8,262	8,547	9,723
Oklahoma	23,353	24,035	27,203
Arkansas	2,795	2,913	3,373
Louisiana	15,773	15,458	16,406
North	2,733	2,650	2,423
South	13,040	12,808	13,983
Mississippi	2,997	3,010	3,047
New Mexico	8,548	8,464	7,473
Texas	128,293	129,504	130,311
East Texas proper	10,092	10,284	12,144
West Texas	56,660	57,313	55,550
Texas Gulf	26,087	26,477	29,062
Other Texas	35,454	35,430	33,555
Wyoming	15,884	16,042	13,553
Other Rocky Mountain	5,202	5,142	4,442
California	31,090	31,571	32,469
Foreign	†12,680	12,372	11,701
Total	273,405	275,768	277,886

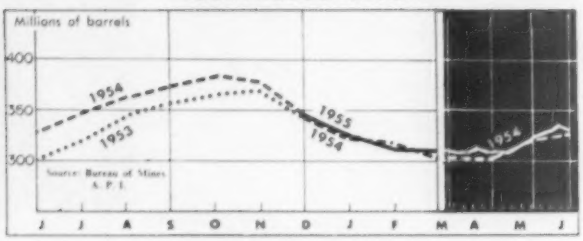
*Bureau of Mines. †Includes 2,867,000 bbl. in California. ‡Included with Kansas.

CURRENT DATA ON RUNS AND PRODUCTION ARE 4-WEEK AVERAGES

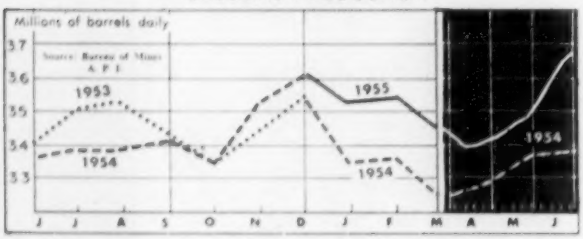
REFINERY RUNS



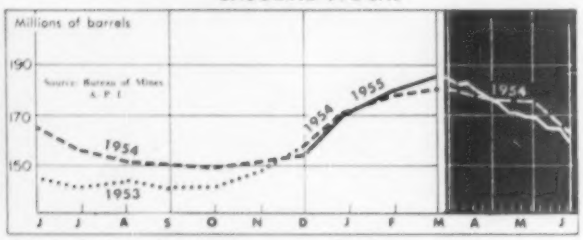
FOUR-PRODUCT STOCKS



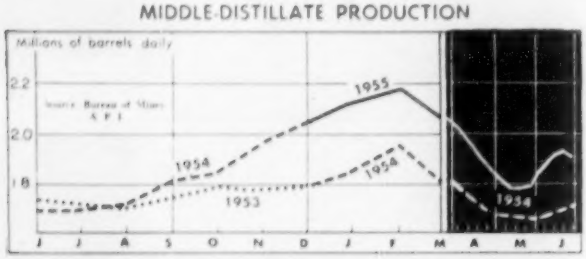
GASOLINE PRODUCTION



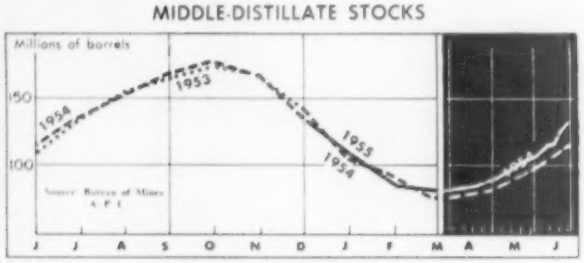
GASOLINE STOCKS



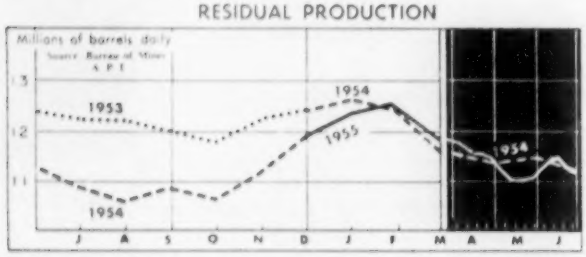
MIDDLE-DISTILLATE PRODUCTION



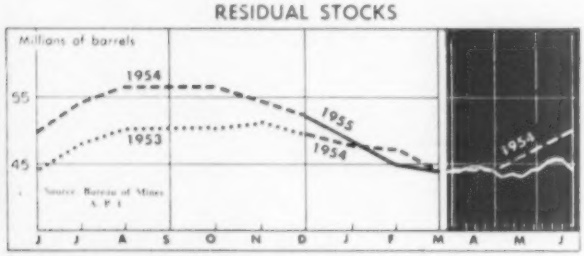
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



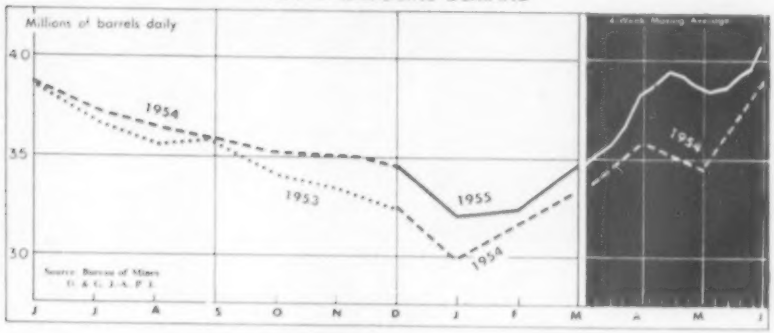
A.P.I. REFINERY REPORT, JULY 1

(Thousands of barrels)

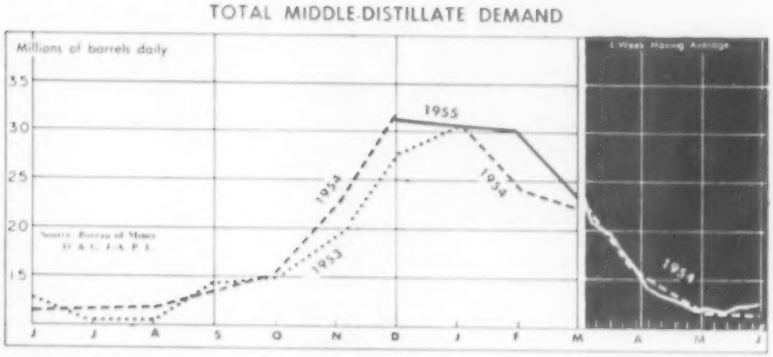
District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, July 1954—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	986	418.0	23.4	259.3	171.6	35,592	11,857	32,774	9,819	1,073	441.0	29.9	241.9	210.9
Appalachian:														
District 1	105	41.0	3.1	25.8	6.4	4,288	507	2,116	390	100	43.9	5.1	20.5	5.5
District 2	101	54.1	6.1	15.7	10.0	2,383	470	771	375	89	48.6	2.2	13.2	10.5
Ind., Ill., Ky.	1,437	775.8	57.6	255.4	174.4	33,843	7,019	18,975	4,545	1,294	696.3	74.0	240.0	157.6
Okla., Kans., Mo.	695	390.4	15.3	167.3	35.9	15,349	1,822	11,228	946	600	342.5	14.6	135.2	32.8
Inland Texas	241	169.9	7.1	42.6	19.0	6,067	396	1,880	1,272	232	171.2	9.7	38.0	26.6
Texas Gulf Coast	1,844	888.4	111.3	439.0	251.0	21,730	4,007	12,454	4,632	1,595	790.4	94.5	370.6	213.1
La. Gulf Coast	660	333.6	45.9	177.4	48.6	9,789	2,122	5,447	1,607	565	264.2	54.2	135.2	41.3
N. La. and Ark.	88	37.0	9.3	17.3	4.0	3,650	1,032	1,841	58	90	34.6	7.5	21.2	6.3
Rocky Mountain:														
New Mexico	21	11.9	0.7	3.0	2.7	255	3	103	29	20	11.3	0.3	3.9	2.9
Other Rocky Mtn*	273	117.0	3.9	66.3	31.4	6,895	295	2,221	812	250	116.3	1.4	58.1	30.8
California	1,048	431.9	5.7	139.0	352.7	19,770	369	10,171	20,314	1,008	424.2	1.9	138.1	350.4
July 1, 1955	7,499	3,669.0	289.4	1,608.1	1,107.7	159,611	29,899	99,981	44,799	6,916	3,384.5	295.3	1,415.9	1,088.7
June 24, 1955	7,464	3,692.9	278.0	1,646.0	1,087.9	164,471	29,132	96,338	45,584					
July 2, 1954	7,005	3,412.6	325.3	1,448.1	1,166.6	164,546	27,942	86,765	50,645					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

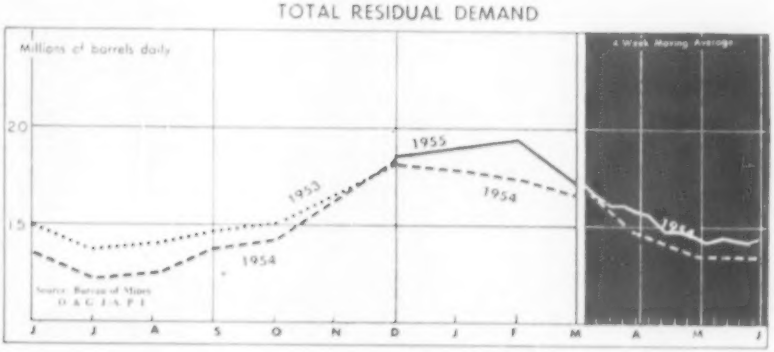
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of July 6, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.75-11.25	11.25-12	10.25-10.75
Premium gasoline	12-12.5	13-13.75	11.50-12
42-44 w.w. kerosine	9.25-9.50	10.05	8.5-8.75
No. 2 straw fuel oil	8.25-8.50	9.3	8.0-8.25
No. 6 residual	$1.75-1.85	$2.35-2.45	$2.00-2.05

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.0	4.5	4.75
Grade 18-55	6.0	5.5	5.75

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

● Many refiners reported heavy movement of gasoline in the week before the long holiday week end. The volume actually consumed will determine the movement for refills over the next week. Residual fuel continues strong, but very little activity is reported for light fuels.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 7-1-55	3,680	4,130
April 1955	3,502	3,786
June 1954	3,379	3,894
July 1954	3,384	3,723
Middle distillate:		
Four weeks ended 7-1-55	1,910	1,238
April 1955	1,847	1,489
June 1954	1,705	1,151
July 1954	1,711	1,105
Residual fuel:		
Four weeks ended 7-1-55	1,123	1,411
April 1955	1,110	1,553
June 1954	1,123	1,339
July 1954	1,089	1,226

SUPPLY AND DEMAND*

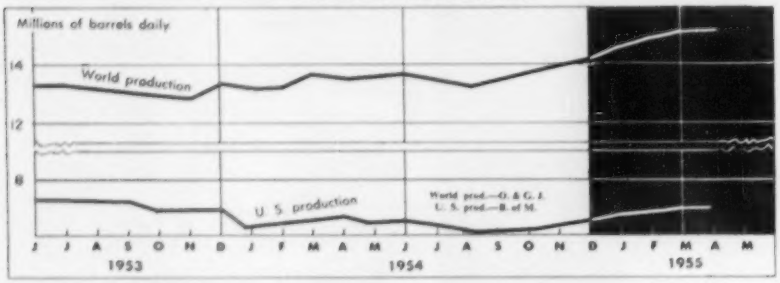
(Thousands of barrels daily)

	April 1955	March 1955	April 1954
Domestic demand	**7,810**	**8,525**	**7,438**
Gasoline	3,704	3,409	3,462
Kerosine	193	353	230
Distillate	1,239	1,879	1,270
Residual	1,456	1,661	1,406
Jet fuel	140	164	103
Lubricants	120	118	111
L.P.G.	342	369	299
Other products	595	551	530
Crude loss	21	24	27
Exports	**357**	**331**	**384**
Gasoline	82	78	85
Kerosine	9	8	22
Distillate	48	57	70
Residual	97	89	73
Jet fuel			2
Lubricants	42	40	51
L.P.G.	11	13	12
Other products	20	21	22
Crude	48	25	47
Total demand	**8,167**	**8,859**	**7,822**
Gasoline	3,786	3,487	3,547
Kerosine	202	361	252
Distillate	1,287	1,936	1,340
Residual	1,553	1,750	1,479
Jet fuel	140	164	105
Lubricants	162	158	162
L.P.G.	353	382	311
Other products	615	572	552
Crude exp. and loss	69	49	74
Stock change	**531**	**68**	**392**
Crude	360	187	281
Products	171	—119	111
New Supply	**8,698**	**8,927**	**8,214**
Imports	**1,123**	**1,319**	**937**
Crude	697	742	574
Products	426	577	363
Production	**7,575**	**7,608**	**7,277**
Crude	6,887	6,886	6,615
Nat. gasoline, etc.	688	722	662
Runs to stills	**7,136**	**7,344**	**6,811**

*Bureau of Mines.

(The schedule of selected crude prices appeared on page 177 of the July 4 issue and will be printed again next week.)

CRUDE OIL PRODUCTION

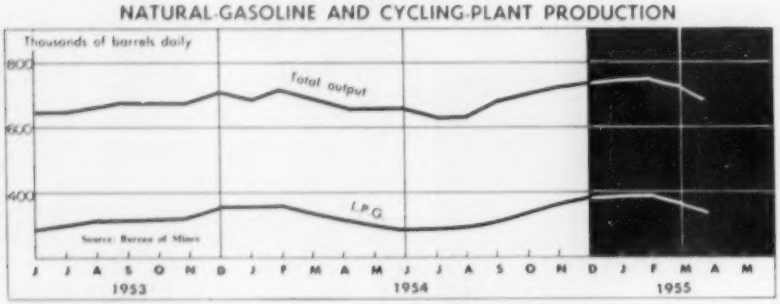

Millions of barrels daily
14
12
8
World production
U. S. production
World prod.—O. & G. J.
U. S. prod.—B. of M.
J J A S O N D J F M A M J J A S O N D J F M A M
1953
1954
1955

CRUDE PRODUCTION

(Thousands of barrels daily)

Month—	U. S.	World
April 1955	6,887	15,148
March 1955	6,886	15,116
February 1955	6,835	14,943
August 1954	6,168	13,428
April 1954	6,615	13,609

NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION

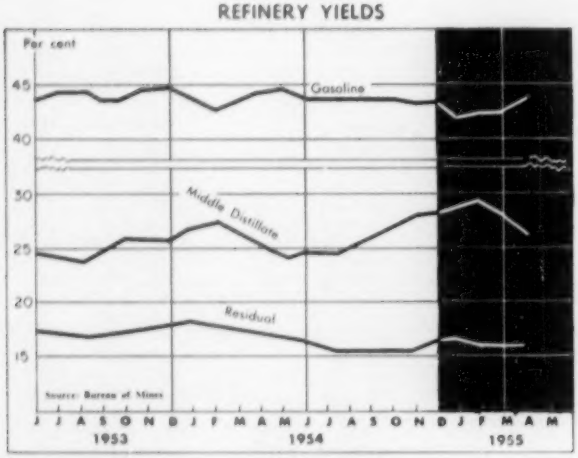


PRODUCTION AT NATURAL-GASOLINE AND CYCLING PLANTS

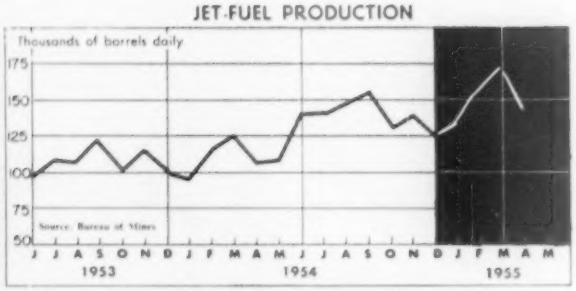
(Thousands of barrels daily)

Month—	L.P.G.	Total
April 1955	334	686
March 1955	361	720
February 1955	390	751
August 1954	289	642
April 1954	313	661

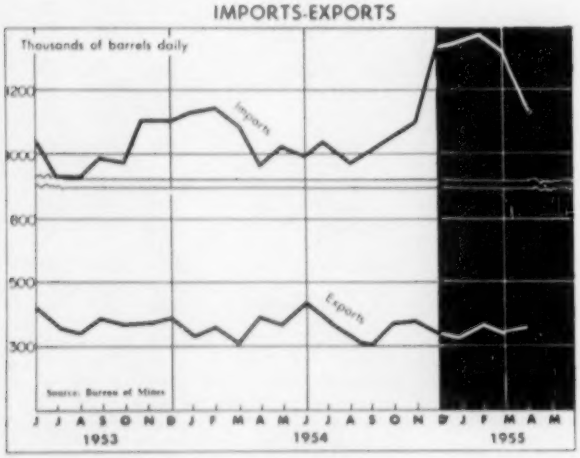
REFINERY YIELDS



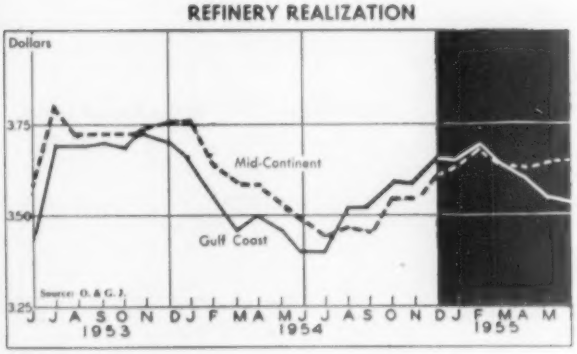
JET-FUEL PRODUCTION



IMPORTS-EXPORTS



REFINERY REALIZATION



REFINERY REALIZATION

	June* 1955	May* 1955	April 1955	June 1954
Mid-Continent	$3.75	$3.66	$3.63	$3.48
Gulf Coast	3.54	3.55	3.59	3.41

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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FOR SALE: A Clean 1500' FAILING Model 44 Rotary Drill and Core Rig mounted on 4 wheel drive truck, complete with Dog House, Light Plant, and tools ready to work. Located in Eastern Illinois. Contact R. A. Landrey, Washington, Indiana. Phone 2395 W.

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Mod. 6-12-1½- x 13, 700 RPM Supercharged, Hydr. Coupling #3497-8, 3500, Very Low Price.

Excellent Condition—War Surplus

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#517—O.C.S. Type 3 Single Drum Unit, with Friction Clutch and Mechanical Controls, Mounted upon 1942 Model LF Mack Truck with 11:00 x 24 tires. No mast or Supports. Good Running Condition FOB Odessa $1,497.44.

#525—Model 50/60 Ideco Unit Powered by ELD 525 Buda Engine, Butane equipped with 250 Gallon Tank. 5 x 7 x 55' Double Pole Mast. Mounted upon 1945 KB6 Tandem International Truck. Complete Unit in fair condition FOB Tulsa $6,000.00.

#533—Cardwell Model KL Double Drum Skid Spudder, Jaw Clutch, Mechanical Controls. Power Model GF-638 Buda Engine, Operates on Butane. 60' Derrick, Three-Sheave Crown, Cable Raised. Unit in workable condition. Engine in pretty fair shape. FOB Seminole $3,875.00.

#536—Franks Model ET-DC Single Drum Well Servicing Unit. Serial No. 401, with 8 x 10 x 62-ft. Single Pole Mast, Tw-Sheave Crown, Cross Sheave, Stinger and Block. Mounted upon International Truck 1941, Model K-8-F, with 450 engine, butane equipped and has two 135-gallon tanks side mounted. FOB Tulsa $7,298.85.

#540—Cooper Model UM Single Drum shop made Winch. Powered by Good VIKU Waukesha with V-Belt Driven Jackshaft. Unit Mounted upon 1950 Model 180 International Single Axle Truck Capable of 4000 foot Well Servicing. No Pole Mast. FOB Tulsa $2,500.00.

#541—Franks ET Serial 222, with 8 x 10 x 62-ft. Single Pole Mast, Divider, Grooved Jacket, Cathead, Mounted on 1948 Model K8 International Truck. Steam Cleaned, painted and adjusted in good serviceable condition. FOB Tulsa $6,210.00.

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DIVISION OF CABOT SHOPS, INC.
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FOR SALE: 4,600 feet of New 20" O.D. x ½" Wall, X-42 Seamless Steel Line Pipe. Box H-897, The Oil and Gas Journal, Tulsa, Oklahoma.

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5—600 HP IR Type KVG Gas Engine Driven 2 Stage Compressors (1942).

$50,000 New Spare Parts for Above.

2—IR Starting Air Compressors, Model 25c, Type 40. 265#, 67.6 cfm.

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1—7'6" x 65'6", 30 trays, 45# psi.
1—7' x 25'6", 10 trays, 347 SS, 50# psi.
1—6' x 58' x ½" Shell Chrome-lined, 21 Trays, New 1951.
1—6'6" x 65' x ⅝" Shell, 17 Chrome Decks, 9 Chrome Baffles.
1—6' x 27', 14 trays.
1—5' x 27' x ⅜" Shell, 10 Trays.
1—3'6" x 49' x ⅞ "Shell, 28 Trays.
1—30" x 34'10" x ¼" Shell, 18 Trays.
4—3' x 50', 3' x 35', 3'6" x 28', Packed Towers.

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2—1250 Barrel Steel Welded Tanks.
2—1000 Barrel Steel Welded Tanks.
10—8' x 15', 5'3" x 38'6", 7' x 15', 5' x 18' Vertical Vessels, up to 400# psi.

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3—Kellogg 2400 sq. ft. Admiralty Tube, 150# psi.
1—Elco Steel Tube 1500 sq. ft., 150# psi.
2—Alco Steel Tube, 850 sq. ft.
1—Griscom Russell Admiralty Tube, 742 sq. ft., 150# psi.
3—Struthers-Wells Admiralty Tube 425 sq. ft., 150# psi.

ATMOSPHERIC HEAT EXCHANGERS

8—715 sq. ft., 850 psig, 550° F., S.S.
6—470 sq. ft. 850 psig, 550° F., S.S.
13—715 sq. ft. 125 psig, 300° F. S.S.
6—715 sq. ft. Admiralty 125 psig, 300° F.

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10,000' of 8", 6", 4" and 2" steel pipe.
500 Ton of structural steel, steel plate, angles and channels.
500 steel gate and globe valves.

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VESTCO
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Denver 17, Colo.

Gasoline Plant Equipment For Sale

3—800# 20 MMCF Absorbers with Scrubbers, etc.
2—150 HP 350# WP Lucey Oil Country Boilers Complete with Stacks, etc., and Steel Building.
1—30"x62' Depropanizer with Accumulator, Reboiler and Condenser.
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1—Fluor "Counterflo" Induced Draft Cooling Tower Complete.

Other Equipment, Instruments, Pumps, Pipe, Valves and Fittings necessary in Gasoline Plant Construction. Detailed Inventory Available upon request.

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75,000' of 6⅝" O.D. 18.97# .280 wall, PE BFW Lapweld Line Pipe, 42' lengths, #2 grade.

7,000' of 24" O.D. 94.62# .375 wall, PE BFW Seamless Line Pipe, 40' lengths, #1 grade.

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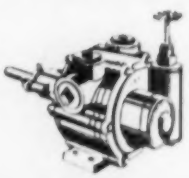

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MUST SACRIFICE one rotary rig, consisting of: Union Drawworks, with all air operated friction clutches. Three 145 h.p. Cummins Diesel engines, compounded. One 7¼"x14" Wheeling mud pump. One A-frame, doubles, reinforced mast and superstructure. One 17½" Oil Well turntable. One doghouse. One fuel tank. One water tank. One light plant. One water pump. Catwalk, pipe racks, and steps. Five drill collars. Contact M. Worthington, Box 606, Holdenville, Oklahoma, or phone 723.

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WANTED truck mounted shot hole type rig 1000 ft. range in good condition. Give location, description and price. Box 861, Fort Morgan, Colorado.

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LOW ENGINE HOURS • REBUILT CANTILEVER MAST •

7¾" x 16" PUMP • STEEL MUD TANKS •

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Please apply only if age 30 or above and providing you possess the required qualifications & experience. Interviews arranged at our expense on basis of confidential complete chronological resume, including education and employment (names & addresses of employers, dates employed, positions held & your specific duties & scope of responsibility, salaries received, location & type of jobs, etc.). Airmail data to

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Pipeline construction equipment manufacturer in Southwest requires man for product development and design work. Write stating full qualifications and salary requirements. All replies confidential.

Box H-898, The Oil and Gas Journal, Tulsa, Oklahoma.

Mechanical Engineers

A medium sized leading manufacturer of oil field equipment and gray iron castings now needs additional engineers for product development and design work. Experience in similar or related work would be favored. All replies confidential. Write stating full qualifications and salary requirements to

BOX H-874,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

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RECRUITING SUPERVISOR, BOX 67

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HELP WANTED

A YOUNG ENGINEER with knowledge of geology for office and field work. You will receive well completion and production experience with independent oil company located in Tulsa, Okla. Please state age, experience, education, references, and salary expected. Strictly confidential. Box H-884, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Chemists with or without experience for positions in Research and Development department, located in Tulsa. State qualifications and salary expected. Write Personnel Department, P. O. Box 381, Tulsa, Oklahoma.

EXPANDING DOMESTIC and foreign activities have created several openings for Party Chief, Seismologist, and Senior Computer. Minimum requirements: five years' experience and formal training in geology, physics and mathematics. Box H-905, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—Seismologist by independent oil firm. Permanent location in Dallas. Give full education, employment history, and minimum salary in initial letter of application. Reply Box H-895, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS

Fast growing independent oil and gas firm, with over 300 producing wells in New Mexico, has opening in Dallas office also southeastern New Mexico. Minimum of 5 years experience. Give full education, employment history, and minimum salary in letter of application. Reply

Box H-910,
The Oil and Gas Journal,
Tulsa, Oklahoma

HELP WANTED

CHEMICAL ENGINEER, with or without experience, for employment in natural gasoline department progressive independent oil company. Must be willing to work in Texas, California or Canada. Prefer a man under 35. Box H-881, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPANDING INDEPENDENT Oil Company wants young geologist experienced in mapping and electric log interpretation (1 to 3 years experience). We want ideas for future drilling. Reply giving age, experience, and salary expected. Box H-904, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Petroleum or Mechanical Engineer for designing oil field equipment. Excellent working conditions. Forty-hour week. Located in Dallas, Texas. Two years actual field experience desirable. Please give age, experience, education and salary expected. Box H-911, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL OR MECHANICAL Engineer, recent graduate, for modern mid-west refinery. Excellent opportunity for permanent employee. Send complete data with original application. Box H-907, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER

Excellent opportunity for young Chemical Engineer in natural gas division of a large progressive independent oil company. Prefer recent graduate or individual with no more than one or two years experience. To be located in Oklahoma. Please submit college transcript and recent photograph.

GEOLOGIST

Recent Geological or Geological Engineering graduates wanted for employment as seismo computer. Will be working with field seismic parties. Excellent opportunity for advancement. Please submit college transcript and recent photograph.

Box H-864, The Oil and Gas Journal, Tulsa, Oklahoma.

MAJOR OIL COMPANY

has opening for experienced Scout. Prefer graduate geologist under 30 with military service completed.

BOX H-906, THE OIL AND GAS JOURNAL, TULSA, OKLAHOMA.

DRILLING ENGINEERS

MAGNOLIA PETROLEUM COMPANY has openings in the drilling section of the Petroleum Engineering Department for several experienced drilling engineers. This section specializes in engineering phases of drilling operations exclusively and is primarily concerned with our Company drilling equipment.

Applicants should desire to make a career in the drilling phase of the oil business.

Age range: 25-40.

Salaries commensurate with experience and level in organization.

Write with complete resumé of experience to:

D. V. CARTER,
Chief Petroleum Engineer,
MAGNOLIA PETROLEUM COMPANY
P. O. BOX 900
DALLAS 21, TEXAS

HELP WANTED

GEOLOGIST for employment in Denver office of aggressive independent oil company. Three years' experience in West Texas geology required. Salary commensurate with experience and qualifications. Send detailed personal history and work experience. Box H-876, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED assistant refinery superintendent. Must be familiar with planning and scheduling of operations. Require heavy distillation experience. Familiar with laboratory and maintenance. State detailed supervisory experience, age, education and salary requirements. Write Box 426, Irving, Texas or phone Dallas RI-4645.

GRADUATE Petroleum & Civil Engineers. Large producing oil company with expanding offshore drilling and production operations needs Petroleum and Civil Engineers for work in their production department. Petroleum Engineers with four years or less experience will be placed in drilling or production engineering work. Civil Engineers with three years or less experience will be placed in the department's construction division. Please write stating age, experience, school, date graduated, etc. Personal interview will be arranged. All replies strictly confidential. Our fee paid. Contact Tom Robinson, owner, Oil Industry Employment Service, P. O. Box 2603, Tulsa, Okla. Phone GIbson 7-5974.

JUNIOR ENGINEER to operate experimental profiling device for water flood injection wells. Unequaled opportunity to learn newest secondary recovery techniques and to participate in experimental work. Location Nowata, Oklahoma. Approximately one-half time traveling. Prefer graduate engineer with working knowledge of electrical circuits and some oil field experience. Write Sinclair Research Laboratories, Inc., P. O. Box 3006, Whittier Station, Tulsa, Oklahoma.

PETROLEUM SALES EXECUTIVE

Required for position managing organization engaged in exporting refined fuels and lubricants. Must have heavy experience in petroleum sales administration. Export-import knowledge helpful. Age 35-50, energetic, healthy. Position now available. New York City headquarters. Excellent salary arrangements. In reply give complete personal history resume. State salary required. Box H-903, The Oil and Gas Journal, Tulsa, Oklahoma.

EXCELLENT OPPORTUNITY with independent oil company for GRADUATE PETROLEUM ENGINEER, under 35, at Midland, Texas. Must have three years' West Texas experience and be outstanding in field production problems, workovers, testing, drill stems and completions. Replies confidential. P. O. Box 3053, Dallas, Texas.

SUBSURFACE GEOLOGIST: Exploration Company has immediate opening for subsurface geologist with 3 to 5 years experience, preferably in Oklahoma. Location in Tulsa. Mail resume including personal history, employment record, educational background and salary requirements to Apache Oil Corporation, 823 South Detroit, Tulsa. All replies confidential.

SITUATIONS WANTED

GEOPHYSICIST—Eight years seis. experience Southwest, desires employment with active company or independent. Box H-879, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING FOREMAN, 39, desires employment with aggressive independent operator or any growing concern serving the oil industry. Thorough experience in drilling operations and well completions. Write 202 Holly Dr., Midland, Texas, Phone 2-2879.

PILOT—A.T.R. with single, multi-engine, and DC-3 ratings, graduate petroleum engineer. Experience in both lines. Interested in flying position, sales, or combination. Burt Hull, Jr., 2230 E. 31st., Tulsa.

EXECUTIVE—39 years old, with fifteen years oil business experience—2 years Latin America and Middle East. Speaks five languages—has worldwide political and business connections, wife a lawyer. Would like administrative position with future. Excellent references. Write Box H-909, The Oil and Gas Journal, Tulsa, Oklahoma.

YOUNG EXECUTIVE familiar with exploration, drilling and producing desires employment with active company. At present with independent. Salary and location open. Box H-899, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PETROLEUM ENGINEER, 38, two degrees, 9 years with Major in Gulf Coast, varied experience. Desire change. Box H-885, The Oil and Gas Journal, Tulsa, Oklahoma.

CONSTRUCTION SUPERINTENDENT. Industrial plant construction, process piping, heavy equipment installation, gasoline plants, chemical plants, refinery and compressor station. M.E. degree, best of references. Available immediately. Will consider foreign assignment. Box H-894, The Oil and Gas Journal, Tulsa, Oklahoma.

DIVISION PETROLEUM ENGINEER, B.S. degree, 11 years diversified experience, drilling, production, completions, workovers, reservoir, valuation work; 35 yrs. old, single, wants job with independent company or oil operator. Consider salary and/or participation. Principal experience West Texas. Box H-889, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL ACCOUNTANT, nine years experience. Presently employed. Desire position with independent company. Replies treated confidentially. Box H-893, The Oil and Gas Journal, Tulsa, Oklahoma.

MAN 30, experienced in land work, initiating and drilling wells wishes to associate with active company. B.A. degree in economics, excellent references. Desires to remain in Tulsa. Box H-913, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING MACHINE and heavy equipment sales and service man available. Well versed in Cable tool and Rotary methods. Experienced in Rotary air drilling for blast hole work. Able to maintain good public relations. Can furnish excellent references. Box H-891, The Oil and Gas Journal, Tulsa, Oklahoma.

SUBSURFACE GEOLOGIST, age 37, seeks connection with active independent in S.E. New Mexico or Four Corners area. Twelve years experience in Permian Basin. Box H-901, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—Geophysicist desires employment with active oil company in exploration department. 6 years experience including supervisory experience with contract geophysical firm. Box H-908, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

EXECUTIVE, Administrative Petroleum Geologist desires exclusive retainer agreement with group interested in buying proven oil and gas properties, drilling deals, leases, etc., or will aid in forming oil company in exchange for executive position and stock bonus. Box H-914, The Oil and Gas Journal, Tulsa, Oklahoma.

OPPORTUNITY to participate in drilling of oil wells on off-set acreage in Illinois. Address—Frederick—500 S. St. James Blvd., Evansville, Indiana.

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Producing oil properties and producing royalties, any amount. Mail engineer's report with last 6 months oil runs.

Inspection made immediately.

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Amarillo, Texas

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Estate of Thomas S. Doran,

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JACK EAGLE, Oil Properties, 706 City Nat'l. Bldg., Oklahoma City, Oklahoma, Telephone REgent 6-7027.

SUBSTANTIAL ROYALTY and mineral interests wanted under patented lands British Columbia, Alberta, Saskatchewan. Either leased or not. Full description and acreage price first letter please. Box 898, Tyler, Texas.

LEASE AND DRILLING BLOCKS

CONTACT A. L. Bowles, Box 947, Ada, Okla., for Drilling Deals, Oil Investments.

FOR LEASE—Oil, Gas and Minerals, Sections 561 also 621, Block D. John H. Gobson, in Yoakum County, Texas. L. J. Luedecke, 1715 Cromwell Hill, Austin, Texas.

FOR SALE: Four producing wells and one suitable for water well. Peru sand. 1830 feet deep. Never flooded but suitable for water flooding purposes. Natural gas for pumping. 180 acres in lease. Room for additional wells. Will sacrifice. Partners do not have money for further development. Southwest Greenwood County, Kansas. Price, $60,000. Write Lloyd K. Jones, Box 128, Emporia, Kansas. Phone 680.

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Bought and Sold—Any Area

Inquiries Invited

B. D. BUCKLEY

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R. E. GROSS,
P. O. Box 144, Berwyn, Ill.

BUSINESS SERVICE

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WANTED

PRODUCTION WANTED: Producing oil properties. Any amount. Mail Engineers report with last 6 months oil run—will pay cash promptly for properties that will pay out 3½ years. Bank reference. John A. Ferris, P. O. Box 2158, Corpus Christi, Texas.

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Houdry Announces Four New Staff Changes

Four new staff changes have been announced by Houdry Process Corp. in connection with its expansion program and establishment of its new chemicals division for the manufacture and marketing of catalysts used in petroleum refining and other industries.

Theodore A. Burtis, supervisor of process engineering, becomes associate manager of research and development at the corporation's laboratories at Linwood, Pa. Joseph W. Schall, director of development, becomes assistant manager of marketing in Houdry's chemicals division.

Julius J. Cicalese, senior process engineer, becomes supervisor of process engineering. George W. Hegginson, assistant manager of catalyst manufacture, becomes assistant manager of manufacturing in the chemicals division.

Lance Named to Sales Promotion by Axelson

The appointment of Douglas C. Lance as sales promotion and advertising manager has been announced by Edward D. Jackson, general sales manager of Axelson Manufacturing Co., Division of U. S. Industries, Inc.

Lance has been advertising manager of Petroleum World and Oil, and prior to war service was with the Gulf Publishing and McGraw-Hill Publishing companies.

Fisher Governor Acquires Thermo Instruments Assets

Fisher Governor Co. of Marshalltown, Iowa, announced the acquisition of Thermo Instruments Co., Belmont, Calif., manufacturers of Capacitance Probe-Type Liquid-Level Measurement Instruments. D. M. Comb, former president of Thermo, is now associated with Fisher Governor in Marshalltown.

A. C. Names Four to Posts In Western Sections

Recently named sales representatives to offices of Allis-Chalmers industries group in western sections of the country are the following: Pleasan Kimball, Oklahoma City; Melville M. Mitschrich, St. Louis, Mo., and Albert E. Nicholson, San Antonio, Tex.

Announcement is also made of the appointment of Charles E. Sismey as service engineer in the Pacific region with headquarters in Seattle.

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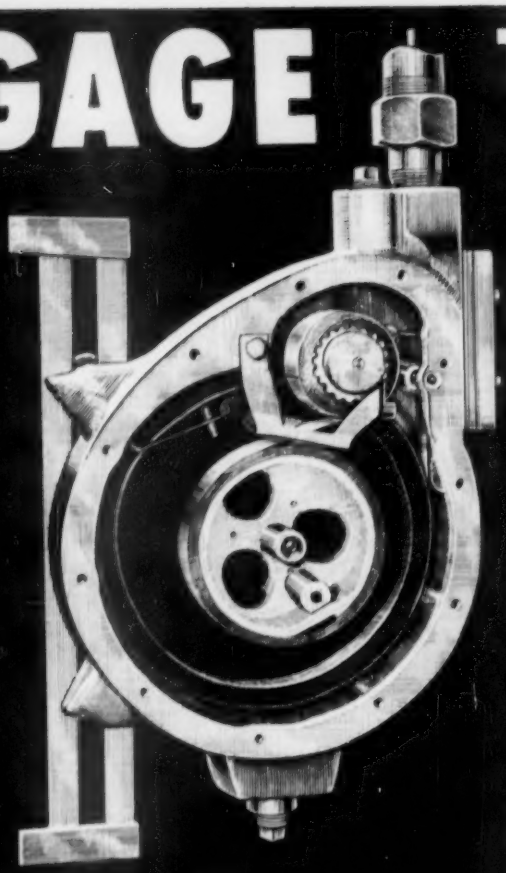

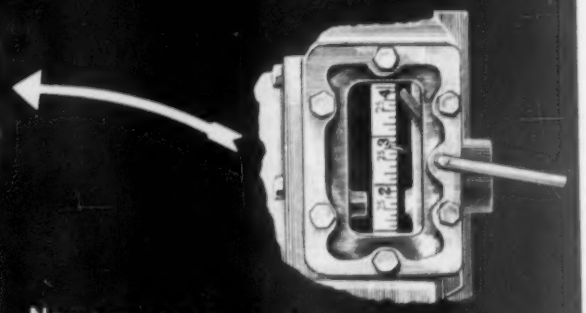

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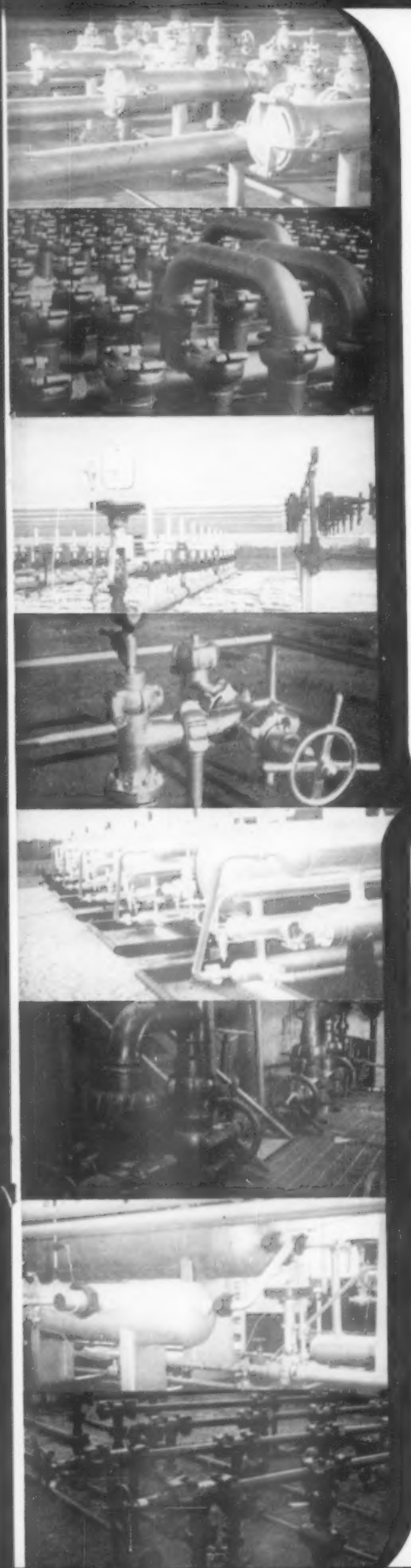

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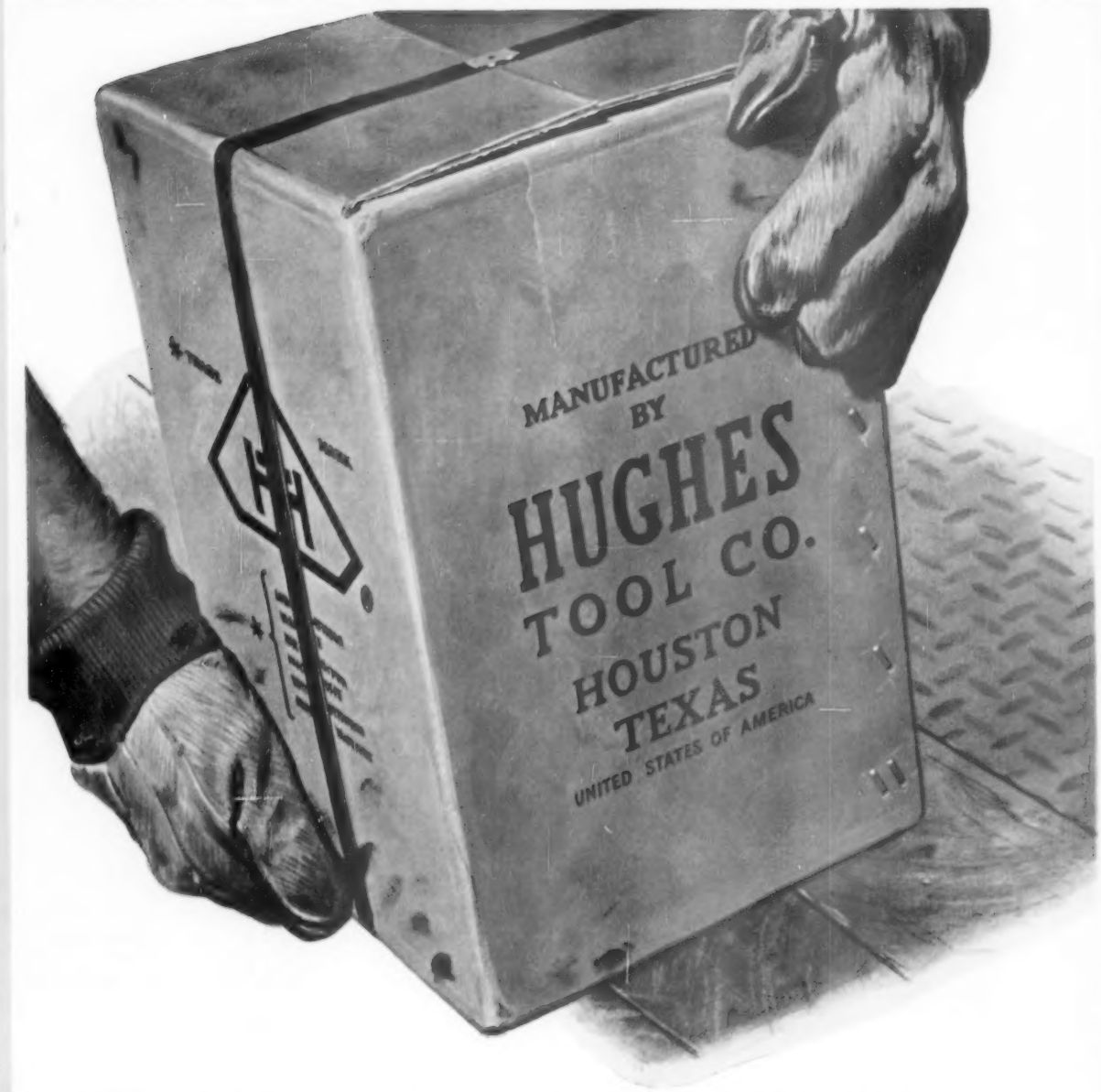

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